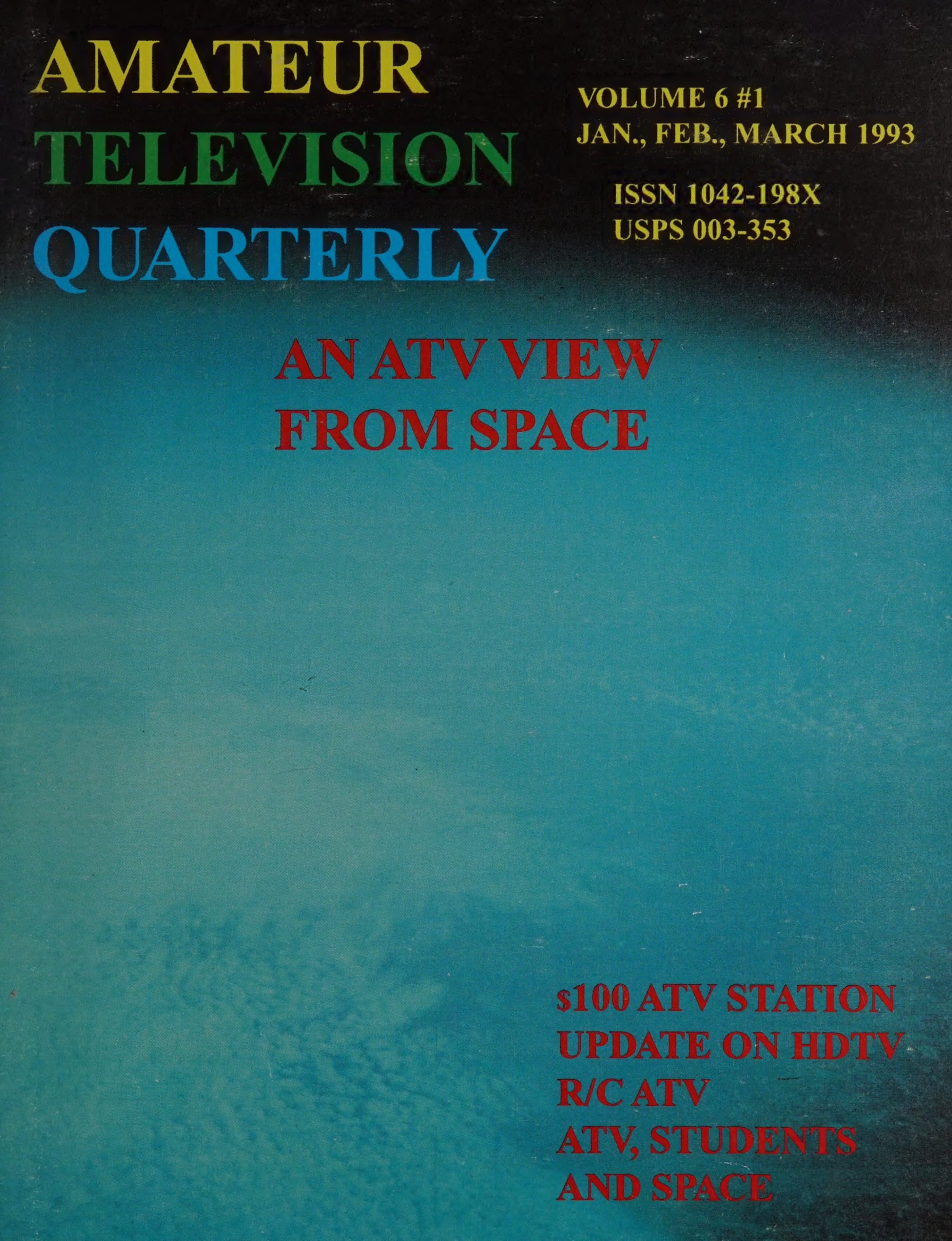
AMATEUR TELEVISION QUARTERLY

VOLUME 6 #1
JAN., FEB., MARCH 1993

ISSN 1042-198X
USPS 003-353



AN ATV VIEW FROM SPACE

$100 ATV STATION
UPDATE ON HDTV
R/C ATV
ATV, STUDENTS AND SPACE

ATVQ

AMATEUR TELEVISION QUARTERLY

V6 #1
Winter 1993
Jan., Feb., March

Amateur Television Quarterly (ATVQ) is published four times per year. Subscriptions are $18/yr. US, $22/yr. Canada and $29/yr. DX. Post Master Note: Change of address and all other mail should be sent to: Amateur Television Quarterly, 1545 Lee St., Des Plaines, IL 60018.

Subscriptions and submissions should be sent to : Amateur Television Quarterly, 1545 Lee St., Des Plaines, IL 60018. Telephone orders and inquiries may be placed using Visa or Mastercard at 708 298 2269. For FAX mail, use 708 803 8994. Unless instructed otherwise, subscriptions start with the current issue. Issues are also sold at most ham radio stores.

Amateur Television Quarterly is mailed variously as First Class mail, Second Class Printed matter, USPO permit 003-353, Third Class mail permit #110 and by other means from Des Plaines, IL and additional Post Offices.

BACK ISSUES

Amateur Television Quarterly is sold out every issue. Back issues may be obtained from EFS Copy Service, 4011 Clearview Dr., Cedar Falls, IA, 50613. 319 266 7040.

INDEX OF ARTICLES

BUILD: UNMANNED AERIAL VEHICLES	3
FM's HOLD ON SPECTRUM REAL ESTATE	7
REVIEW: VS100 ATV RPT CONTROLLER	12
BUILD: $100 ATV STATION	14
TELCOS EYE TWISTED PAIRS	15
HDTV UPDATE, SYSTEM SPECS	17
SHOOTING A VIDEO	20
BUILD: CHEAP WEATHER COVER	21
THE MAG WHEEL	22
TAMING THE SC-1043 BRICK	25
BUILD: 10 GHZ ATV PROJECTS	27
BUILD: HORN AERIALS FOR 10 GHZ ATV	30
NICAM DIGITAL STEREO	39
COMPUTE RF PATH LOSS AND C/N RATIO	40
ARE YOU LOST?	44
K3TAZ FSTV REPORT	45
COASTAL ATV REPEATER (SAVANNAH)	46
EMERGENCY COMMUNICATIONS AND ATV	46
SPECIAL REPORT: STUDENTS, SPACE AND ATV	49
WAUSAU DREAM FLIGHT	49
SPECTRA III FRANKLIN HS	59
ANOTHER ATV BALLOON FLIGHT	60
BUILD: CHEAP 10 GHZ MEASURING DEVICE	64
LITCHFIELD SIXTH ANNUAL ATV DINNER	65
DEER HUNTER FINDS DARA BALLOON	66
SOUTHERN LOUISIANA ATV CLUB	66
NEW MD/PA ATV CLUB	67
RACE CAR ATV	68
ATV NEWS AND READER LETTERS	69
NEW JERSEY BELL FIBERS CABLE TV	74
RF POWER MODULE PCB, MN ATV, HAMFESTS	76
TESTING COAXIAL LINES	77
TROUBLED BY RFI-TVI? MANUFACTURERS GUIDE	80

RADIO SCAN NOW AMATEUR COMMUNICATIONS

AMATEUR COMMUNICATIONS formerly Radio Scan is sporting a new monthly ATV column. The column is written by Henry KB9FO, with material provided by ATVQ readers, with introductions and explanations added for the non-ATV'er. Your submissions to ATVQ can now reach an even wider audience through Amateur Communications Magazine. Amateur Communications has two editions, English and Spanish with world wide circulation. Amateur Communications covers topics of general interest and all special modes including ATV, and Packet. For a sample copy, write to Amateur Communications, 8250 NW 27th St., suite 302, Miami, FL, 33122-9920.

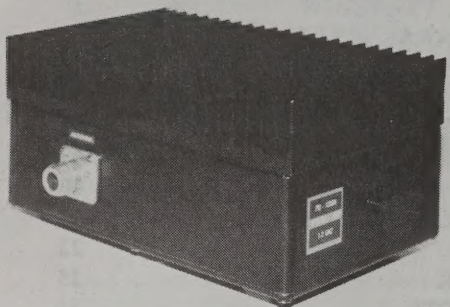
ADVERTISER INDEX

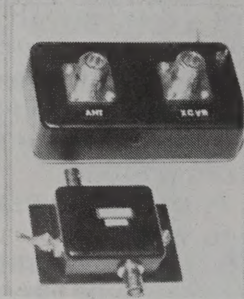
AEA	Cover IV	International Crystal	43, 48	Quest	Cover II
All Communications	34	Micro Computer Concepts	11	Rutland Arrays	5
ATV Electronics	13	Micro Video Products	48	Spectrum International	33, 74
ATV World	16	Olde Antenna Lab	62	Video Control	43
Comet Antennas	19	Pauldon Associates	2	Subscription forms	38
Down East Microwave	48	P C Electronics	23, 24	Book shop	35, 36, 37, 63
Elktronics	26	Parabolic	10	Discount Video Tape	58
HF Technology	6	Pictoronics	29		

Our apologies for the errors in the index last issue.

pauldon ASSOCIATES

210 Utica Street Tonawanda, NY 14150 (716) 692-5451





BRICKS: NEW P.C. BOARDS & SCHEMATIC INCLUDED
SAU-11 902-928 Mhz. for FM use or ATV at reduced output ½ W. = 10 W. $25.00
W57762 1.2 Ghz. Linear use for FM, ATV, or SSB. 18 W. ½ W. = 18 W. 99.00
SAU-4 420-450 Mhz. (Linear) ½ W. = 18 W. 81.00
M57745 420-450 Mhz. (Linear) ½ W. = 35 W. 120.00
OTHERS — INQUIRE.

POWER AMPLIFIERS:
426-450 Mhz. (Linear) T/R Switched
PD-440N P.A. ½ W. drive (T/R) = 18 W. output. We custom build for your input $119.00
SAME WITH PREAMPLIFIER 145.00
PD-440N-1 ½ W. or your request output = 35 W. T/R 155.00
PD-440N-2 ½W. drive = 75 W. output T/R 285.00
NOT T/R SWITCHED (For Repeater Use) 10 W. = 80 W. 199.00
ABOVE: Large Heat Sink & Diecast Box
PD-440N-3 10 W. drive = 80 W. output T/R 235.00
ALL OF THE ABOVE USE POWER GAIN BLOCKS

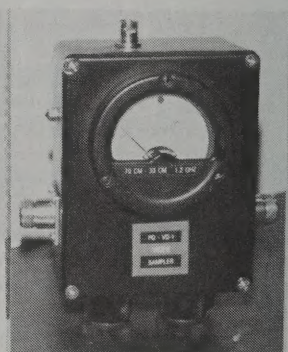
MINI POWER AMPLIFIER FOR 420 - 450 Mhz.
PD-440N (Mini) 100 MW. = 2 W. & ½ W. = 6 W. $85.00
PD-900N 902 - 928 Mhz. ½ W. = 10 W. output FM or ATV with reduced power 65.00
PD-33LP 902 - 928 Mhz. linear P.A. ½ W. = 7 W. output (2 stage) 119.00
PD-33HP linear P.A. 7 W. = 18 W. output 116.00
ABOVE are for 906 to 928 Mhz. band
PD-33VLP linear P.A. ½ W. = 1.5 W. out 49.00
PD-33VLP-1 P.A. for the (33 cm.) band 1 Mw. = 8 W. output 123.00
CAN BE USED FOR THE MINI POWER DRIVERS that are commercially available for home TV. Separate receiver and transmitters (EX: VC-2000)
P.A. for 1.2 Ghz. band
PD-1200N P.A. 1 W. = 18 W. (linear) $165.00
PD-1200N-1 P.A. 2 W. = 36 W. (linear & diecast) 285.00
DUPLEXED POWER AMP. for 70 cm. & 2 meters
PD-270-1 2-4 W. drive on either band = 35 W.
FM on 2 meters & FM or SSB on 70 cm. band 265.00

ATV DOWNCONVERTERS
GaAs Fet transistor used in both the 70 cm. & 33 cm. models TV channel 3 or 4
Tunes from 420 - 450 Mhz.
Board & all parts wired $60.00
Mounted in cabinet 73.00

Downconverter for the 902 - 928 Mhz. band TV channel 3 or 4
Board & all parts wired $68.00
Mounted in cabinet 80.00
Mounted in a diecast box 88.00

PREAMPLIFIERS
PD-440S 70 cm. 426 - 450 Mhz. preamplifier is a SINGLE GATE type using either a NEC 2SK-572 or a Mgf 1302 transistor. Noise figure is 0.6 db. and has a gain of 16 db. or better. It operates from a 12 - 13.8 volt supply, is diode protected and has a 5 volt regulator for stability. The source leads are by-passed with disc capacitors and the input uses a high "Q" piston Trim Pot. The output is not tuned so that the noise figure is consequentially low. A Toroid is used in the output, with capacitor coupling to the output. In this model either BNC or "N" connectors are used. $51.00
PD-440TRL is a tower mounted 70 cm. preamplifier whose description is similar to that of the PD-144TR-L except has "N" connectors 150 Watt thru capacity 119.00
FOR VOLTAGE FEED THRU COAXIAL CABLE 150 Watt thru capacity 129.00
PD-900 is a 902 - 928 Mhz. preamplifier with a noise figure of 0.6 - 0.7 db. and a gain of 14 to 16 db. with BNC .. 65.00
"N" Connectors 70.00
PD-900TR is an R.F. sensed preamplifier and can be transmitted through with a maximum power of 20 W. 119.00
PD-1200 — SAME AS THE PD900 except 1.2 Ghz. .... 65.00 and 70.00
PD-1200TR 1.2 Ghz. preamplifier with R.F. sensed T/R switching (20 W.) 119.00
PD-2300 is for the frequency range of 1.8 - 2.4 Ghz. (No T/R Switching Capability) 72.00

OTHER PRODUCTS AVAILABLE: FM TRANSMITTERS AND RECEIVERS, SAMPLERS (VIDEO), Etc.
CALL OR WRITE FOR ADDITIONAL INFORMATION OR CATALOGUE.



The PAULDON ASSOCIATES Model PD-VD-1 ATV VIDEO SAMPLER unit picks up your transmitted Fast Scan TV signal by sampling the transmission line with near negligible insertion loss. It employs 2 Type 'N connectors for input and output connections. The furnished BNC mentioned on the top of the unit is used as a video output port, useful for connections to a CCTV monitor or scope (for adjusting proper video and sync levels). Transistors included in the electronic circuit design are: Q1-ECG 123, Q2-ECG 123 and Q3-ECG 159.

$63.00,

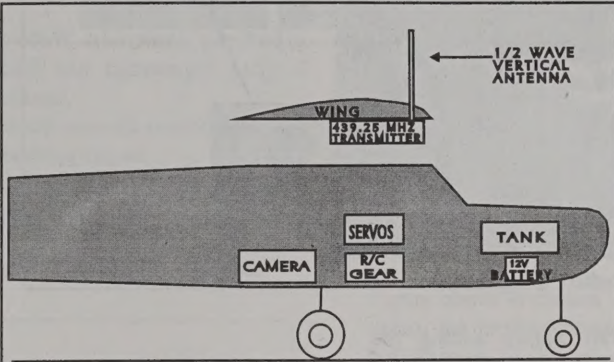
INTERDIGITAL FILTERS
PD-1002 439.25 MHZ.
$150.00
PD-1004 910.25 MHZ.
$145.00
7 pole, 7 adjustable tuning rod design. Freq. adjustable to 6 MHZ. by rotation of the screws at the end of each rod. Insertion loss less than 1db. Out of band attenuation 80 db. +/12 mhz. from theVSB passband.Atten. at the LSB sound sub. carrier 30db.
OTHER FILTERS AVAILABLE
WRITE OR CALL

UNMANNED AERIAL VEHICLE with ATV

A Progressive Approach

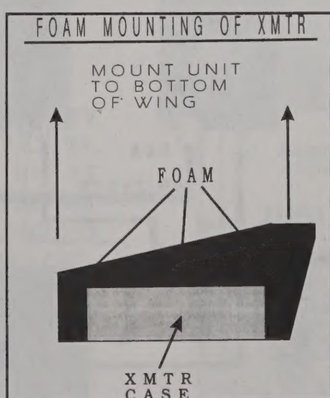
by Ron Berkman KA9CAP

Based on my own successful experience with UAV's (Unmanned Aerial Vehicles) and most recently, with the addition of Amateur Television (ATV) I can report the following:



AIRBORNE COMPONENT PLACEMENT

1) You must first master the arts, crafts and sciences associated with flying an R/C model aircraft (UAV) as follows:
   A) Construction of airworthy airframes from kits and/or plans.
   B) Handling 2 and 4 cycle model aircraft engines in glow plug and ignition (spark plug) configurations.
   C) Installation of guidance systems (R/C receiver, batteries, servos, wiring harnesses, and associated pushrods, etc. to actuate the control surfaces.
   D) Learn to fly an R/C model aircraft proficiently. (My own experience showed that I required 125 flights of 10 minutes duration to produce automatic responses to flight situations. This works out to 20+ hours of flying experience.
   E) The safest and most economical method of learning is with a flight instruction obtained by joining an AMA (Academy of Model Aeronautics) chartered club in your area.
2) You must become a licensed Amateur Radio Operator of Technician Class or higher. (Ham Radio Operator).
   A) This process acquaints you with the vagaries and "Black Magic" of RF (Radio Frequency) electronics and makes you aware of restrictions placed on Amateur Radio Operations by the FCC (Federal Communications Commission).
   B) The best and most efficient way to obtain this background is through your local Amateur Radio Club which will likely be offering classes. If this is not available, you may obtain self instruction texts from electronics outlets, Radio Shack and the ARRL (American Radio Relay League). If you are computer literate and possess a means to download programs from BBS's you may obtain shareware or freeware which provides self instruction via your computer.
   C) Being a "HAM" gives you access to a wide variety of persons who possess knowledge that you need as well as surplus electronic equipment either directly or at "Hamfests" (amateur radio flea markets). This occurs because you are "in communication" with other persons who are interested in electronics, etc.



3) Armed with all the foregoing background, experience and "connections" you are now ready to pursue your initial goal of developing an UAV with an ATV link to the ground. At this point I will describe my own experience and make references to what appear to be suitable alternative options.

   A.) <u>Stable Airborne Platform</u> (R/C aircraft)
      A.1) Any stable model aircraft capable of carrying a minimum of 24 oz. payload without causing major changes in the flight performance of the aircraft. This payload is <u>in addition to</u> the weight of the radio control system a already installed during the period that you familiarize yourself with the aircraft <u>before</u> installing the ATV system. e.g.

      -SIG Kadet Senior (this is the one I used)
      - Hobby Lobby Telemaster 70 or larger

      Ace 4-60

      Other - any airframe that meets the requirement of being able to lift a payload and maintain low airspeed as a result of a light but strong airframe. Your choice! Could be a big Pipe Cub, Curtiss Robin, Taylorcraft or who knows? An ideal airframe would be a pusher - twin boom aircraft such as the military's Pioneer. This configuration allows for mounting the camera in nose either in fixed position, or on gimbals so that the camera could be aimed

UAV WITH ATV

right-left, up-down by R/C servos.

A.2 AXIOMS: When laying plans for installation of a payload, the following axioms must be followed:

A.2.a Try to keep the heaviest components of the ATV system located near or forward of the CG (Center of Gravity) as specified on the plans for the aircraft.

A.2.b Try to keep the weight of all components to a minimum.

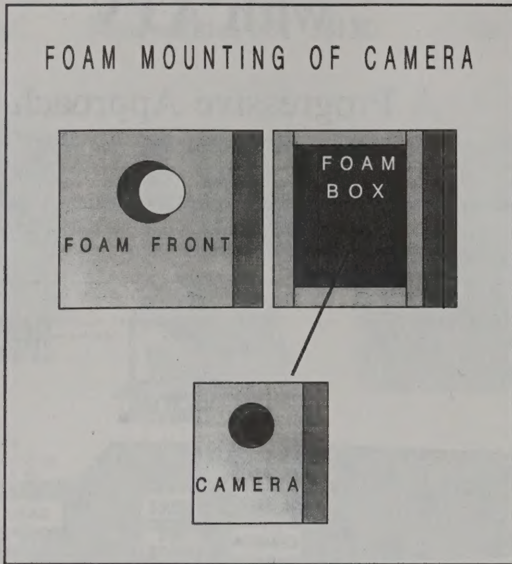
A.2.c Try to keep all cable or electrical lead lengths of interconnected components to a minimum, particularly those of the radio control system.

A.2.d Test fly the aircraft before adding the payload to familiarize yourself with the idiosyncrasies of the aircraft. (know your plane!)

A.2.e Familiarize yourself with the characteristics of nicad or other battery packs used to power the R/C system and the ATV system. This includes providing charge/discharge systems for conditioning the battery packs for reliable service.

A.3 Description of Sig Kadet Senior R/C aircraft

- Wingspan 78 inches, Chord 15.5 inches
- Fuselage length 58 inches
- Fuselage width at payload bay 4.25 inches
- Power from Fox .40 ball bearing with muffler
- Tank has 10 oz. cap for 20 to 30 min flights
- Propeller (JZ) Zinger 10-6 XW (XW = extra wide blades)
- Covering is Monokote
- Stock aircraft except for addition of 3/16" sheeting to the bottom center section of the wing to provide a mounting surface for the ATV transmitter. The center rib was given more depth to allow for a 5/16" hole to be drilled through to accept the vertical antenna on the top of the ATV transmitter box.
- See Diagram "AIRBORNE COMPONENTS PLACEMENT".



A.3.a Provisions must be made for anti-vibration and shock mounting of all components of the R/C and ATV systems. This usually means wrapping them in soft foam of 1/8" thickness or more and providing a means of holding the components in place in the aircraft. (I prefer modified eyelets and rubber bands.)

- See Diagrams "FOAM MOUNTING OF CAMERA" AND "FOAM MOUNTING OF XMTR"

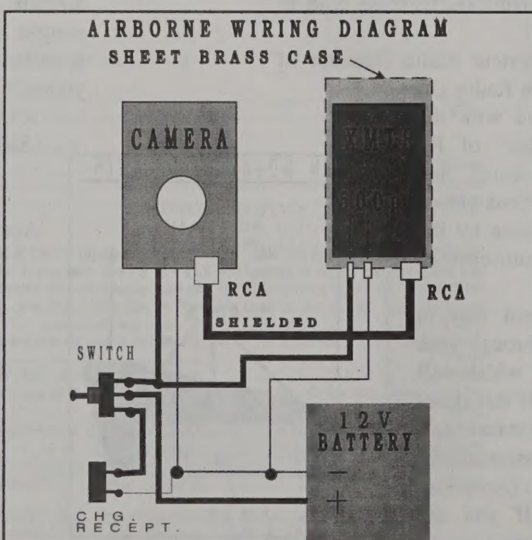
A.3.b Description of R/C system used:

- Transmitter - Ace Micropro 8000 - 53.5 Mhz.
- Receiver - Ace Silver Seven - 53.5 Mhz with eans pigtail connectors and shortened pigtails.

Servos - Ace Bantam servos with shortened pigtails.

R/C airborne battery - 4 Gates AA nicads from Indy R/C with Deans connector. The cells are mounted in an Ace "square" battery case.

Wiring harness - Ace on/off switch with Deans charge connector wired in for mounting on the side of the fuselage (away from exhaust).



B. ATV (airborne) equipment used:

B.1 PC Electronics TXA5-70 transmitter board.

B.2 Micro Video mini black and white camera.

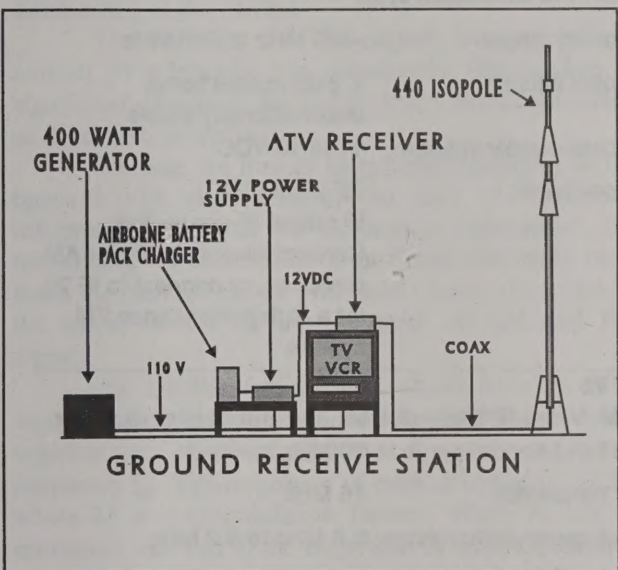
B.3 Ten (10) AA sized nicad batteries (Sanyo from Ace R/C) wired in series

to provide 12 volts nominal.

- B.4 See <u>Diagram "AIRBORNE WIRING DIAGRAM"</u>

C. ATV (ground) equipment used:

- C.1 PC Electronics TC-70-1 xcvr to receive airborne signal.
- C.2 Samsung VM3105 TV-VCR combination to monitor airborne video and to record each flight.
- C.3 12V 3 amp power supply to power TC-70-1 and other devices on the ground (e.g. battery charging systems).
- C.4 Powermate PM 500 400W continuous gasoline generator. Very small and lightweight 110V supply for field operations.
- C.5 AEA 440 Isopole vertical antenna mounted on a Radio Shack roof mounting tripod.
- C.6 See <u>Diagram "GROUND RECEIVE STATION"</u> for information on necessary power cords and coax required. Note: the coax is 8835 with "N" connectors between the TC-70 and the Isopole.



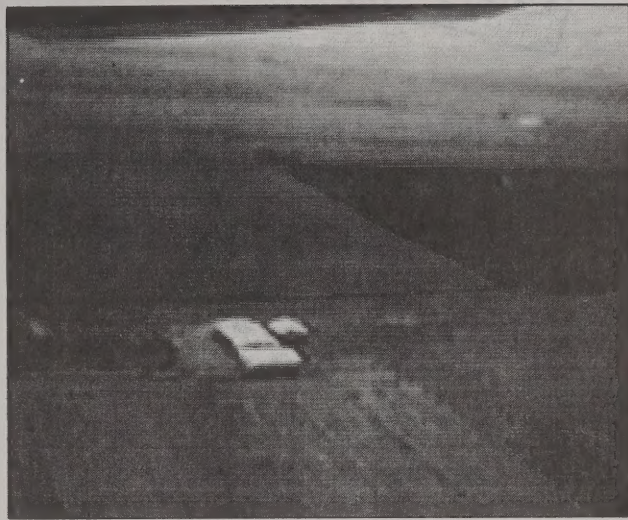


Figure above is camera eye view from R/C aircraft. On live video, the farmers house, corn field, harvested field and out buildings are easily recognized. This is a scanned image which has been re-scanned for hard copy printout. (Then re-scanned to be published, ED)

DAYTON 1993

DON'T MISS THE ANNUAL ATVQ DAYTON ATV SYMPOSIUM AND PARTY. FRIDAY NIGHT, 7-12 PM, AT THE HOLIDAY INN NORTH, JUST OFF I-75 AT WAGNER ROAD. ROOM FOR HUNDREDS IN AIR CONDITIONED COMFORT. DRINKS AND MUNCHIES PROVIDED. EXPERT PRESENTATIONS, EYEBALL QSO, EQUIPMENT DEMOS AND DISPLAYS, LOTS OF FUN!

THE W9NTP SSTV GET TOGETHER IS USUALLY IN THE ADJACENT MEETING ROOM.

FM'S HOLD ON SPECTRAL REAL ESTATE

By Randy Hoffner

reprinted from TV Technology

Frequency modulation has the inherent advantage of a higher signal-to-noise ratio than amplitude modulation. You know by now that there is no such thing as a free lunch, so it should come as no surprise that a price must be paid for this advantage, and that price is occupied bandwidth.

Spectral Real Estate

An FM signal occupies a significantly larger piece of RF bandwidth, or spectral "real estate" than an AM signal carrying comparable information. Why is this so? It is because many more sidebands accompany an FM signal than an AM signal, and, as you may remember from Radio 101, the information is in the sidebands, not the carrier.

Theoretically, an FM signal has an infinite number of sidebands, but, fortunately, the number of *significant* sidebands, the loss of which will be perceived as distortion, is limited.

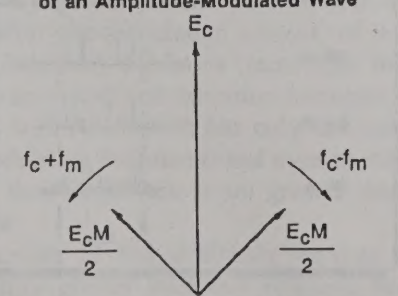
Because the loss of significant sidebands in the received FM signal means the loss of significant information required to accurately reconstruct the modulating waveform, the significant sidebands must reach the receiver and be processed. Let's take a look at the nature of the sideband content of AM and FM signals.

An amplitude-modulated signal consists of a carrier component of amplitude E_c and frequency f_c, together with a pair of sidebands for each modulating frequency f_m. The amplitude of each sideband is $\frac{1}{2}E_cM$, where M is the modulation factor. When M has its maximum value of 1, the amplitude of each sideband is one-half that of the carrier component. The frequencies of the two sidebands are $f_c + f_m$ and $f_c - f_m$.

Sideband Rotation

Figure 1 is a vector illustration of the AM carrier and its two sidebands. If the carrier is considered to be stationary, the sidebands rotate around the reference point, one advancing at $f_c + f_m$ and the other retreating at $f_c - f_m$ (in the conventional pictorial representation of angular rotation, the "positive" direction of rotation is counter-clockwise).

Figure 1.
Carrier and Sideband Representation of an Amplitude-Modulated Wave



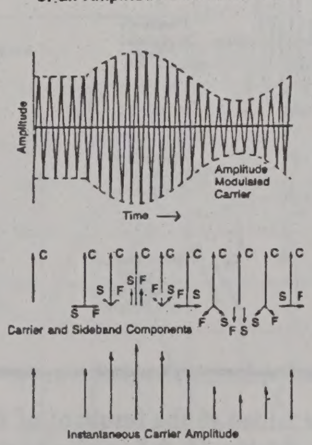
The resultant of the two sideband vectors adds to or subtracts from the carrier component's amplitude.

Figure 2 represents the waveform, a vector diagram of the carrier and sideband components, and the resultant instantaneous carrier amplitude for a single cycle of sine-wave amplitude modulation. The advancing sideband *F* is traveling faster than the carrier component, and the retreating sideband S is travelling slower.

The FM carrier has very different characteristics, as seen in **Figure 3.** In (a), the FM carrier vector is swinging backwards and forwards as a result of being modulated.

We can add to the carrier component a pair of sidebands like the AM ones–designated *1* in (b)–but at right angles to E_c. This gives the resultant vector representation shown in (b), with the top of the carrier vector following the straight line ABC. This was in fact the principal employed by the pioneer of frequency modulation, Edwin Armstrong, but it is not true FM, because the vector's length is varying.

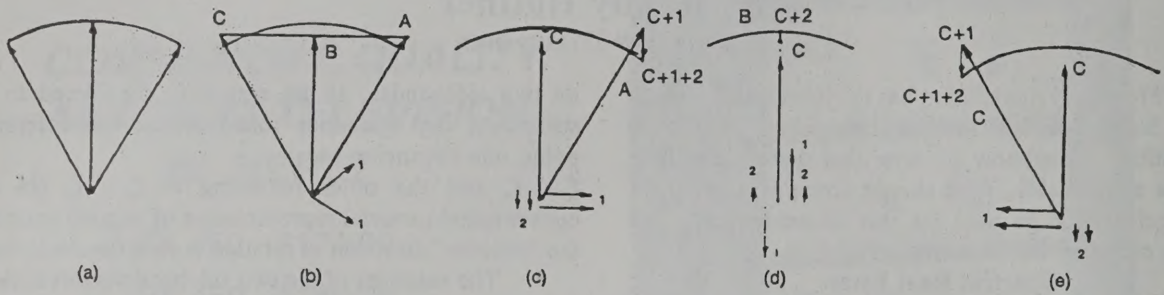
Figure 2.
Vectorial Representation of an Amplitude-Modulated Wave



Follow The Arc

To be true FM, the vector should follow the arc rather than the straight line in its travel back and forth from A to C through B, which requires the vector's length to be reduced at A and C and increased at B.

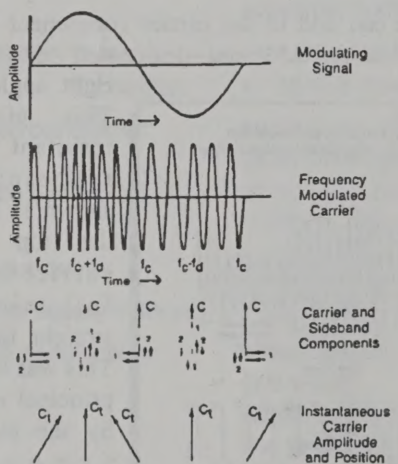
Figure 3. The Function of Harmonic Sideband Components



This can be achieved by adding a second pair of sidebands (designated 2 in **Figure 3** (c) of frequencies $f_c + 2f_m$ and $f_c - 2f_m$, and therefore travelling at twice the speed of the fundamental sidebands $f_c + f_m$ and $f_c - f_m$.

These are the second harmonic sidebands, and

Figure 4.
Vectorial Representation
of a Frequency-Modulated Wave



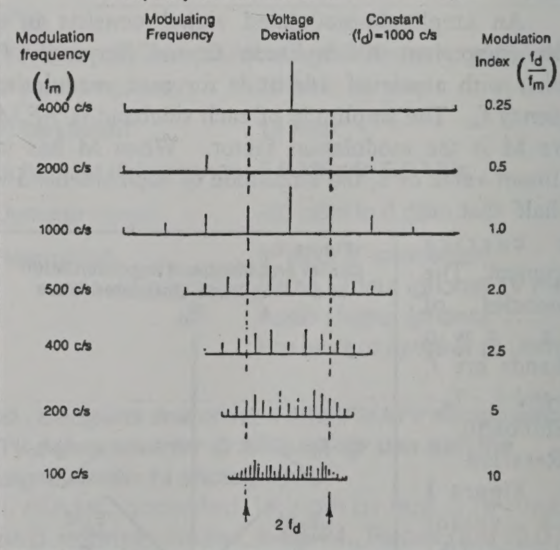
when they are vectorially added to the resultant of the carrier and fundamental sidebands, the carrier vector's amplitude is lowered to the arc at point A in its angular swing **(Figure 3** (c). Ninety degrees later in the fundamental cycle, the fundamental sidebands are opposing each other, and thus have no effect on the total carrier amplitude **(Figure 3 (d).**

However, the second-harmonic sidebands have moved through 180 degrees of their cycle, and they add to the vector's length to lift it up to the arc at B.

In **Figure 3** (e), the fundamental sidebands have travelled another 90 degrees and the second harmonic sidebands have travelled another 180 degrees, with the result that the vector's length is again reduced to fit on the arc.

Figure 4 follows a carrier through one cycle of sine-wave modulation, when the angle of swing is small enough that only the fundamental and second-harmonic sidebands are significant. Compare this with the AM case shown in **Figure 2.**

Figure 5. The Effect of Modulation Frequency on Sideband Content of an FM Signal



As the carrier's angle of swing is made progressively larger, points on the arc move progressively farther below the corresponding points on the straight line, and progressively more harmonic sidebands are required to keep the total carrier vector on the arc. Because for a constant modulating amplitude E_m the angle of swing decreases with an increase in modulating frequency f_m, we find that at high modulating frequencies, with their large swing angles, there is a large number of sidebands.

Holding Steady

Figure 5 shows what happens when frequency deviation f_d is held constant at 1000 Hz and modulating frequency f_m is varied. As frequency is lowered, the modulation index and the number of sidebands increases. Increasing f_d increases the angle of swing and produces more sidebands, as illustrated in **Figure 6,** which assumes a constant modulating frequency of 200 Hz and shows how the sideband content increases as deviation is increased.

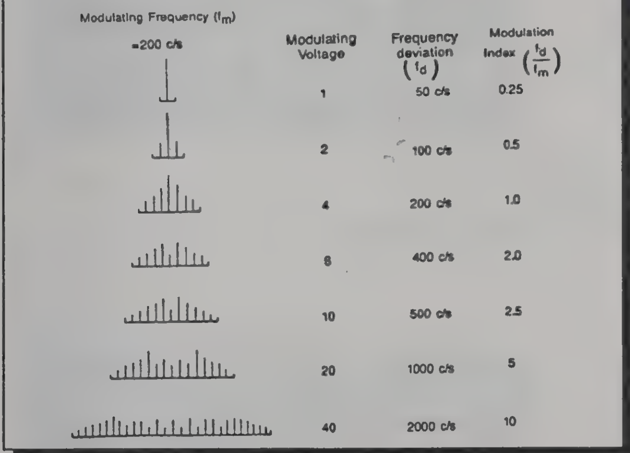


Figure 6. The Effect of Modulation Voltage (Deviation Frequency) on Sideband Content of an FM Signal

This gives us another perspective on why FM has a signal-to-noise ratio superior to AM. The number of sidebands (and therefore the modulation content) of the signal increases as frequency decreases (remember the triangular noise characteristic) and deviation increases.

Contrast this with AM, which has only one pair of sidebands per modulating frequency, and even at 100 percent modulation their amplitude is no greater than one-half the carrier's.

The large number of FM sidebands requires a bandwidth significantly greater than that required for AM transmission in order to take full advantage of FM, and to avoid distortion in the received signal. Carson's Rule states that the bandwidth required for FM transmission and reception is equal to $2(f_d \text{ max} + f_m \text{ max})$, twice the sum of the maximum deviation frequency plus the maximum modulating frequency.

This illustrates why far more bandwidth is required for stereo than for monophonic transmission. For monophonic television audio, the maximum deviation frequency is 25 KHz and the maximum modulating frequency is 15 KHz, and the required bandwidth is 80 KHz.

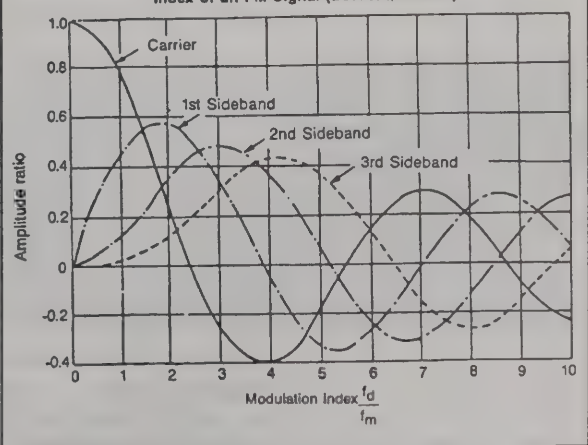
For TV stereo, the maximum modulating frequency increases to about 47 KHz, while the total deviation increases to 55 KHz, and thus the Carson bandwidth increases to about 204 KHz.

If SAP is added, the maximum modulating frequency increases to about 94 KHz, total deviation increases to 70 KHz, and the required bandwidth becomes about 328 KHz. When MTS was being contemplated, concern arose over the fact that a multichannel television sound aural signal containing both stereo and SAP needed about four times the bandwidth of a mono television aural signal. The concern was with the aural notch bandwidth in television aural/visual notch diplexers.

FM Complexities

The relationship between carrier and sideband components is rather simple for AM, but quite complex for FM. The FM carrier and sideband relationship is described by a Bessel function, illustrated in **Figure 7.**

Figure 7. Amplitude Variation Versus Modulation Index of an FM Signal (Bessel Function)



The amplitudes of carrier and sidebands depend on the angle of swing, and sometimes they reduce to zero. This phenomenon facilitates very precise setting of carrier deviation using a technique called Bessel nulling,

FM REAL ESTATE

which involves modulating the carrier with a sine wave whose frequency is very precisely set.

As the amplitude of the modulating sine wave is increased gradually from zero, the sideband content of the signal progressively increases, and the amplitude of the carrier decreases until a point is reached when the carrier totally disappears. This is the first carrier null.

As the amplitude of the sine wave is increased beyond the first carrier null point, the carrier gradually reappears and becomes larger, as the sideband content decreases. Further increase in the sine wave's amplitude will eventually produce a second carrier null, and third, etc.

Carrying On

The first carrier null occurs when the angle of swing Ø, also known as the modulation index (f_d/f_m), is 2.4048 radians. To cite an example, the television engineer needs to have a precise reference point for setting the aural modulation level in order to transmit maximum stereo separation. There are several Bessel nulls that may be used, but the simplest one finds the point at which exactly 25 KHz deviation, 100 percent modulation of the main or monophonic aural carrier, is reached. The modulating frequency required to produce the first carrier null is calculated from the equation:

$$f_m = f_d/\emptyset =$$
$$25 \text{ KHz}/2.4048 \text{ radians} = 10.396 \text{ KHz}.$$

The modulating frequency must be precisely correct, or the carrier will disappear at a different deviation. It is also possible to use the second, third, etc. carrier null, or a null of the first, second, third, etc., sidebands. The null to be used is usually chosen on the basis of what accurate sine wave frequency is readily available.

Acknowledgements

This discussion on sidebands rounds out our mini-series on frequency modulation.

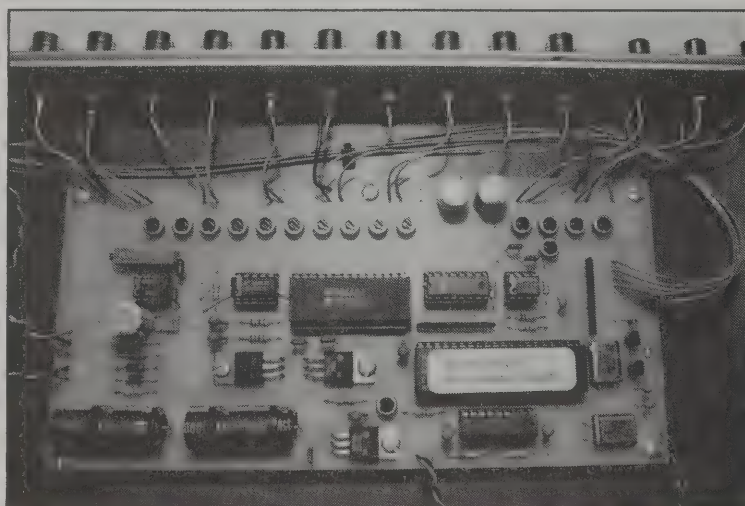
Acknowledgement; All of the figures included here have been adapted from Sturley, K.R., "Frequency-Modulated Radio," New York, Macmillan, 1956. Figures 1-6 are from pages 14, 15, 16, 17, 18 and 20 respectively.

. . . " *Randy Hoffner is director of research and development at NBC Labs.*

Micro Computer Concepts VS-100 ATV Repeater Controller & Remote Video Switcher

A Review by Dave Pelaez, AHZAR/8

A commercially available ATV repeater controller? Yes! Not only is it available now, it's of an extremely high quality design, and also is priced very reasonably! NOTE: Many of the primary user functions are explained in this article, however, there are some secondary user functions that I have intentionally skipped, for brevity's sake.



Ron Wright, N9EE, founder of Micro Computer Concepts had quietly introduced possibly the first commercially available microprocessor controlled Amateur Television Repeater Controller about three years ago. Little fanfare has been given to this controller, even though Ron has been producing other very high quality VHF/UHF repeater controllers for quite some time. Ron advertises this controller as the VS-100 ATV Repeater Controller and Remote Video Switcher, and it is packaged in "rack-mount" configuration. The system requires 115 volts AC which is internally converted to +12 and -12 volts DC. Priced at $399.95 the controller is a very well designed repeater controller with provisions for switching up to ten video and four audio inputs.

The controller has three modes of operation: the repeater mode, the san mode and the manual mode. These modes are controlled via the control audio receiver (provided by the user) by using touch tones. Each of the ten video inputs has separate video level adjustments. In the repeater mode, the VS-100 selects the ATV repeater receiver video inputs and it samples for video sync. As soon as sync is detected, the ATV transmitter is keyed and the receiver video is routed to the transmitter. This will continue until the video is removed or a ten minute timeout occurs. The repeat mode has a ten minute continuous transmission limit and is reset with either the ATV input dropping, or by receiving a touch tone code via the control receiver audio. The VS-100 can be set up to scan three separate video inputs entering the "repeat san enable" control code. A "disable" control code will abort the scanning of the three separate video inputs and use the present video input as the receiver input. A "repeat one minute transmit" user code will force the repeater video input to be selected and the transmitter to transmit for one minute. Sync need not be present during this time, to keep the transmitter keyed. This feature is useful for sampling video signals which are very weak, or could be utilized to turn an antenna for the strongest video signal. After one minute, the controller will resume normal operation. As one minute is a default time, this period can be changed by the user in fifteen second intervals. There are also provisions for a repeat audio select function.

In the scan mode, the VS-100 is controlled by user touch tone codes. The system will scan the video inputs, from inputs one to ten. When the video is detected at the scanned input, the controller lock onto this input for thirty seconds and transmits the video. After thirty seconds, the next video input is selected by "Looking" for sync. If no video sync is detected after .3 sec, the next video input is selected. This sequence continues from input one through ten, rolling over to input one and will stop when video is detected. Again, the scan mode can be aborted at any time by touch tone control select of another controller function.

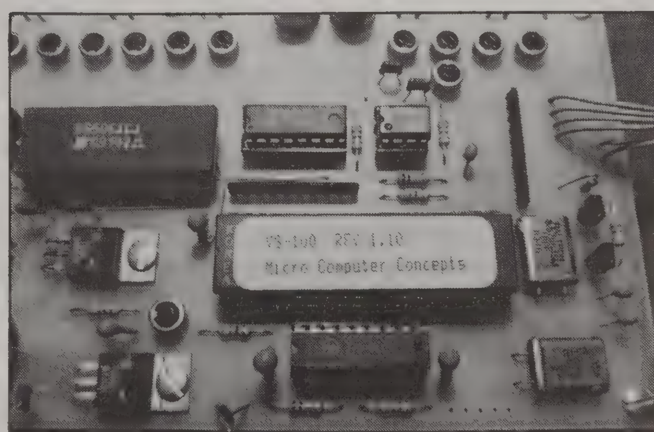
In the manual mode, the controller can be forced to look onto any one of the ten available video inputs, and one of the four audio inputs. In the manual mode, the user can simply select which of the video or audio inputs to view/hear by entering a single digit corresponding to the input desired. During this mode, the controller will key the transmitter even if video sync is not detected.

VS100 ATV CONTROLLER

The VS-100 identifies by using CW on the audio, and by video. The actual video ID utilizes a user-provided Elktronics video ID board or can use another user-provided composite video sources. Both audio and ideo ID's (including the four screen Elktronics video ID'er) can be enabled and disabled with the appropriate control code. As there is plenty of extra room within the VS-100 cabinet, an Elktronics board or other repeater building blocks can be incorporated within the "extra closet space".

As mentioned, the control of the VS-100 relies on a user provided audio receiver. The controller relies on the extremely reliable 8751 CPU EPROM, and is not subject to memory loss if power fails. It can be overwritten, however, under the control of the microprocessor.

Auxiliary outputs are available, and are controlled by touch tone. These outputs allow for controlling external devices such as remote camera power and panning, power amps, antennas, and the control of a rotor for antenna turning. The user is required to provide the supporting auxiliary output buffer circuits as all auxiliary outputs are TTL. Ron shows an example of a buffer circuit in the VS-100 manual, and is recommended whenever the user connects to external devices.



APRIL QST TO CONTAIN ATV ARTICLE...WATCH FOR IT!

GETTING ON ATV FOR LESS THAN $100.00
(A ONE EVENING PROJECT)

David A. Clingerman, W6OAL

I'm sure that many of you have entertained the idea of getting on ATV at one time or another. But the cost has prevented you from doing so. Sure, you can drop a thousand really quick going First Class with PC Electronics, and there is nothing wrong with that. However, you might want to start out on the simpler side with less expensive equipment, see if you like the mode and then spend the month's mortgage payment.

Many of you have probably seen the 900 MHz Pirate TV Broadcast systems produced for the intended use of distributing video using a VCR as the source, to remotely located TV sets around the house, without the use of cable. These have been advertised in stock clearance houses publications like DAK and even Radio Shack has a brand of these available. The price on these is steadily dropping and now is less than $50.00 for the pair (transmitter and converter) and less than $35.00 for each additional receivers/converter. Universal V9900 Interview Security Instruments, Inc. is the brand advertised in DAK and the system I acquired. It is a double sideband Amplitude Modulated (A5) transmitter that outputs a milliwatt and is tunable over the range of 913 - 920 MHz as it comes out of the box. Expanding the frequency range to cover the entire 33 cm ham band is no problem, simply get inside and do a little tweaking, more on this later. The oscillator is varactor controlled so a greater voltage excursion is all that is needed. The receiver is a simple, straight forward, low side LO injected converter that takes 900 - 930 MHz down to TV channel three. Sweeping the converter over the 900 - 930 MHz input range using an HP C Sweep Oscillator and an HP 86222B RF Plug-in monitoring of the signal was done on an HP 8566B Spectrum Analyzer, a -70 dBm signal produced a down converted signal of -57 dBm (+13 dB conversion gain) that was 11.5 MHz wide to the -3 dB points (59.25 - 70.75 MHz) and was +/- 2 dB of flatness. The tuning control was centered (at the detent). This is definitely <u>not</u> PC Electronics quality, but then again not too shabby for a piece of consumer electronics equipment. Full tuning range is from 47.44 - 77.8 MHz. However, gain falls off rapidly yielding a -10 dB bandwidth of 18.28 MHz (56.28 - 74.56 MHz).

The units come with a couple of fold down quarterwave stubs that are about as efficient as a dummy load. So, the first thing that has to be done is get the RF efficiently outside the box on transmit and employ some reasonable antenna and the same goes on receive. Starting with the transmitter, remove the four corner screws from the bottom of the box (not the ones in the little rubber feet). As the plastic cover comes off, lifting it over the little stub antenna, wires will be attached to the "switch/power indicator" board and the "rectifier/regulator/control" board. Unplug the connector at the "rectifier/regulator/control" board, the one attached to the metal chassis. On the right-hand side of the plastic cover drill a 0.422 dia. hole at the location indicated in Figure 1. Use a variable speed drill motor to avoid ripping the side out of the cover and wiping out the little post just inside and to the front of the hole location. This hole will allow access to the RCA phono jack that is mounted on the side of the transmitter filter. Using a Switchcraft RCA phono plug or equivalent (metal shell needs to be no shorter than 0.900"), attach a length of coax. The RF can now be brought out of the box to a real antenna or reasonable facsimile. The wall plug power supply that is supplied, one with each unit (rx, tx), outputs 16 VAC @ 180 ma. You may want this equipment to operate on 13.8 VDC for convenience and portable operation. If so, do the following; remove the three screws that hold the "rectifier/regulator/control" board to the metal chassis. Bend the circuit board up so the traces under the board are visible. Remove the four diodes (1N4002's). Place jumpers in the D_2, D_3, holes, anode to anode, cathode to cathode respectively, and solder in place. Secure the circuit board with the three screws previously removed. Reconnect the "switch/power indicator" board plug to the "rectifier/regulator/control" board. Fit the plastic cover over the little stub antenna and secure to the metal chassis with the four corner screws previously removed. Cut the power cord off the wall plug power supply, check with an ohmmeter to determine the convention of the return (ground/minus) side of the power lead. Mine have the wire with the white runner as the positive or center conductor of the power plug lead. Connect banana plugs of different colors or your own convention to the power lead. On the rear of the chassis near the power receptacle, sandpaper of "16 VAC" and with an indelible marker write, "13.8 VDC."

The ATV simplex frequency, on this band, according to my most recent band plan, (sometimes varies with state), is 910.250 MHz with the common repeater input frequency being 923.250 MHz.

TELCOS EYE TWISTED PAIR VIDEO

reprinted from TV Technology

CAMBRIDGE, Mass. Dial-up, on-demand, VHS-quality video and digital audio over regional telephone companies' twisted pair telephone lines may soon be offered to 75 percent of U.S. homes, a top telephone industry executive said recently.

The new service–another potential competitor to broadcasters, cable, and direct broadcast satellite enterprises–could be operating on an experimental basis in parts of the country as early as this year and available to American consumers on a widespread basis within two to three years, said Jules A. Bellisio, executive director of video systems and signal processing research at Bellcore Labs in Red Bank, N.J.

"In recent years we've realized that the information-carrying capacity of twisted-pair wires is much greater than we imagined," Bellisio said at a recent symposium on digital video sponsored by the Massachusetts Institute of Technology. "It is highly feasible to send rates up to 1.5 megabits or more over existing telephone wire that goes to houses."

Giant Step

Video delivery, even a VHS-quality service, would be a major step for the nation's telephone companies, which are lobbying for the right to deliver video programming, but would be hard pressed to finance coaxial cable drops to the home if, as is likely, they are forbidden to subsidize video service with telephone revenues. A basic dial-up movie service, for example, over copper wire would be a relatively quick way to build revenue to finance expanded services later.

However, a movie service would be only one possibility. Speaking at the symposium, Bellisio named a host of other options, including on-demand, compact-disc quality music recordings, remote-controlled CD-I software and high-speed access to huge databases, such as libraries and museums.

One unique application that Bellisio suggested, is a "virtual computer". A customer could use an at-home video display and keyboard and rent the computer configuration of choice over the phone line.

Bellcore, Bellisio said, has proposed two new "twisted pair" digital services to its clients, the regional phone companies. One is called ADSL (Asymmetrical Digital Subscriber Line) for homes and HDSL (High Speed Digital Subscriber Line) for business.

ADSL would offer 1.544 megabit per second (Mbps) transmission in one direction plus a low-speed control circuit that would allow the customer to communicate via terminal to the central office. POTS (plain old telephone service) would also operate simultaneously with other services on an ADSL line.

HDSL offers 1.544 Mbps in both directions and could prove useful as a new system for broadcast remotes.

The new services, which use MPEG data compression, could be implemented immediately in about 75 percent of the United States, Bellisio said. The only areas that cannot receive the services are those whose load coils are currently used in the telephone circuits. (Load coils act as low pass filters and are used to neutralize capacitance.)

"A lot of things we thought had to be done on broadband services are now actually realizable at much lower bit rates than we originally proposed. Much of this is due to new image compression techniques," Bellisio said. "At a 1.5 megabit rate, the system produces pictures which, to my eye, look like a VCR and in fact in many ways look better than tapes you rent."

Market Forces

Whether ADSL will be used to deliver personalized video and audio entertainment services to homes is up to the individual phone companies and their subcontractors, Bellisio said.

"Business decisions will have to be made to determine the actual services offered to customers. Obviously there are many potential applications. We are a laboratory and are simply giving the regional phone companies technology options."

Though "thin wire television," as the new technology is named, is a major technological breakthrough for the phone companies, it is not seen as a threat to the ideal digital distribution medium of fiber optics, Bellisio said. In fact, he noted, ADSL could serve as a logical evolutionary bridge between today's home phone system and fiber.

"As the system grows, fiber will get closer and closer to the customer. It then becomes more and more economical to complete the fiber network . . . that's the evolutionary bridge," he said.

Bellisio emphasized that ADL service "is not intended to replace anything" and differs from the multiple channel programming delivered by traditional cable TV.

"It's a different kind of service which can provide a certain number of hours of very customized video to the home," he said.

Easier Approach

ADSL is far simpler and more economical than existing ISDN and T-1 lines, which already carry digital data, Bellisio said.

"ADSL, like T-1, is a transport technology. Both are just raw technologies that carry bits," he said. "But T-1 is a very stressful system used to carry high bit rate data transmission on different wire pairs between central offices. It requires clean wires and a digital repeater every 6,000 feet. It's not economical for the residential market. ISDN, on the other hand, is an entire system concept with a rich array of protocols and signal messages that can carry 64 Kbs and upward."

Twisted-pair wire was invented more than a century ago. In fact, Alexander Graham Bell got a patent on it shortly after inventing the telephone. He created twisted-pair wiring as a way to reduce crosstalk between circuits that were close to each other.

Over the years, Bellisio said, the total number of twisted-pair copper loops in the United States has reached 120 million and they are now valued at about $60 billion.

"We can't just wave our hands and say we are going to replace all the loops with fiber." he said. "We have to treat these loops as an asset to use and not as a liability to go away as fast as possible."

Continuing our coverage of HDTV progress ATVQ Presents:

ADVANCED TELEVISION
LOOKING AT SYSTEM SPECIFICS
By S. Merrill Weiss
reprinted with permission of TV TECHNOLOGY

(Note to non-broadcast readers: Even though this column concentrates on broadcast system proposals and transmitter issues, the technology discussed has been proposed as well for other media such as cable and wireless cable and is equally applicable to all media.)

Of all the many aspects of advanced television, the terrestrial broadcast transmission plant is probably the most fraught with challenges for system designers and operators. It offers the greatest number of different potential implementations, will have the greatest licensing and regulatory oversight, will likely be the greatest single cost element in implementation, and will likely have the highest profile exposure to public interest in the details of the implementation of ATV.

It certainly may also have the largest impact on a television station's long-term ability to reach and serve its audience. And its construction will take place at a time when there will be little or no audience yet established for ATV.

It certainly may also have the largest impact on a television stations' long-term ability to reach and serve its audience. And its construction will take place at a time when there will be little or no audience yet established for ATV.

Consequently, it is most important that those who will participate in terrestrial broadcasting of ATV begin the process of understanding and planning the required transmitter facilities as soon as possible.

This will permit the maximum amount of time for completion of the required tasks while still meeting the FCC's deadlines. It will also permit the maximum number of possibilities to be explored, thereby yielding optimal solutions in terms of coverage, timeliness and cost.

To this end, this and the next installment of this column will examine some of the factors that will enter into the design of the ATV transmitter plant. We will also doubtless return to this area from time to time as more information becomes available from proponents and the various testing labs.

Channel Coding Technology

In this column last month, we looked at an overview of the ATV system and described Channel Coding as the portion of the system that takes the compressed image from the Source Coding (compression) process "and converts it to a form that can be sent through the medium to be used. Thus the channel coding may very well be different for terrestrial broadcast, cable, satellite, wireless cable, or tape recording, even though they carry the same form of source coding. Included in this function is any modulation required. The output signal usually has analog characteristics that embody the digital information."

Before looking at some of the specifics of transmitters, antennas, and the like, let us take a look at the proposed systems and how their various channel coding schemes work.

There are currently five ATV systems under consideration for terrestrial broadcasting. Four are digital systems, and one is analog. The five systems use four different channel coding schemes with three basic technologies. With regard to transmission performance as much as anything, it is the channel coding schemes that differentiate the systems and can lead to differences in performance in the terrestrial broadcast environment.

Without going into why they do what they do (which we'll save for another time), let us take a brief look at the three basic approaches. Then we can see how the systems apply them. Finally, we can look at how the various choices impact the designs that will be required for transmitter plants.

Quadrature Amplitude Modulation

Quadrature amplitude modulation (QAM) forms the basis for three of the four digital (five overall) systems. QAM uses constellation of points (as viewed on an X-Y display much like a vectorscope) that have specific amplitudes and phases.

For terrestrial broadcast, the QAM system proposed use either 32 points (32-QAM) or 16 points (16-QAM), as shown in Figures 1a and 1b, respectively. Because 32 is 2^5, it represents 5 bits. Because 16 is 2^4, it represents 4 bits. (128-QAM = 7 bits, 64-QAM=6 bits, and 8-QAM=3 bits are also possible and may be used in non-broadcast systems).

A QAM signal can be generated by suitably modulating with multi-level signals two carriers in quadrature and then adding the modulated signals together. There is inherently no carrier in a QAM signal.

As in the familiar case of NTSC color bars, the QAM signal modulation moves from one point to the next, dwells there for a while, then moves on to the next point. The time that the modulated signal dwells at a single point is called the symbol period, and the data it carries is one symbol.

In NTSC-color-bar terms, we could think of this as the bar width representing the symbol period and the color representing a symbol. The fact that there is a fixed symbol period for a given system implies that there is also a fixed symbol frequency that, as it turns out, determines the data rate of that system. The data rate is the symbol frequency multiplied by the number of bits per symbol (5 for 32-QAM, 4 for 16-QAM).

Multi-level Vestigial Sideband

The multi-level vestigial sideband (VSB) method uses amplitude modulation of a carrier by data that has been converted to either four amplitude levels or two amplitude levels. The four levels represent 2^2, or 2 bits. The two levels represent 2^1, or 1 bit. Thus this method yields 2 bits per symbol for four levels and 1 bit per symbol for two levels.

The 2-level signal can be thought of as similar to the digits of closed captioning signals while the 4-level signal is similar to an unmodulated stairstep signal in which the steps can come in any order. Ordinary VSB-AM

would generate a carrier, but it can be suppressed or replaced with a pilot signal.

It might seem at first that the multi-level VSB approach, because it has a smaller number of bits per symbol, would have a lower data rate than the QAM systems. This does not turn out to be the case, however, because a fixed channel bandwidth (such as 6 MHz) can accommodate a symbol rate for VSB modulation that is about double that of a QAM approach. Thus the maximum data rate of the multi-level VSB method is about the same as for QAM. (More about the significance of the word "maximum" shortly.)

Pulse Amplitude Modulation

Pulse amplitude modulation (PAM) converts data, which might, for instance, be representative of amplitude levels of an analog signal, into amplitude levels that can modulate a carrier. If the data is packaged eight bits at a time, 256 (2^8) levels are produced. Because this is fundamentally an analog modulation method, some form of signal synchronization capable of detection by analog circuitry is required.

There are other forms of modulation possible to carry the kinds of signals under consideration for Advanced Television. Examples are such forms as quadrature phase shift keying (QPSK) and coded orthogonal frequency division multiplex (COFDM). Because they have not been proposed for terrestrial broadcasting in the United States but may be applied to other portions of ATV systems.

Channel Coding Methods

Now that we have identified the basic technologies, let us survey their applications by the proposed system. Some of the systems have certain spectral features designed to avoid interference into critical points of existing NTSC signals. Figures 2a, 2b, 2c and 2d show the spectral shapes of each of the systems to be described in the following paragraphs.

We will look at the reasons for the spectral features when we go into the theory of the systems in greater depth in a future column. For now, we will concern ourselves with aspects of the systems that will impact transmitter plant design.

DigiCipher

QAM is applied in its "pure" form by two systems: General Instrument's DigiCipher and Channel Compatible DigiCipher, developed jointly by General Instrument and MIT, as the Advanced Television Alliance (ATVA).

The precise characteristics of the two systems are slightly different, but their fundamental operation is the same. The carrier frequency is in the center of the 6 MHz television channel. The symbol rate is approximately 5 Msymbols/second (MS/s), and the total data rates are about 25 Mbits/second (Mb/s) for 32-QAM and 20 Mb/s for 16-QAM.

Selection of 32-QAM or 16-QAM is left to the station, depending upon its particular circumstances. The 32-QAM approach yields higher picture performance, but 16-QAM has a lower reception threshold and hence better coverage for a given transmitter power level. The "normal" mode of operation is considered to be 32-QAM.

Both 32-QAM and 16-QAM have flat spectra across the 6 MHz channel. The symbol rate has been selected so that, when combined with suitable baseband pulse shaping and IF bandpass filters, the maximum data rate is achieved in the channel with moderate guard bands at the channel edges. (See Figure 2.) As mentioned previously, there is no carrier generated by the QAM modulation.

AD-HDTV

A variation of the QAM system is the spectrally shaped QAM (SS-QAM) system proposed by the Advanced Television Research Consortium (ATRC) for the Advanced Digital HDTV (AD-HDTV) system. It uses two 32-QAM signals in the 6 MHz channel, dividing the data between them. This dual-channel approach allows the creation of some unique differences relative to the other systems.

Taking advantage of the rejection region of the Nyquist filter in NTSC receivers tuned to co-channel NTSC stations, the lower QAM channel can be transmitted at higher power. This, combined with its lower symbol rate, makes it a more reliable channel, able to be received at lower signal levels.

Consequently, data most needed for the creation of a picture, the so-called "high priority" data, are sent on the lower channel. This yields a form of graceful degradation as the signal level falls and the upper (standby priority) channel suffers from the "cliff effect", the sudden failure to recover the signal that is typical of digital transmission systems using large amounts of error correction. Under such conditions, a lower quality but viewable picture, together with its audio, remains.

DSC-HDTV

The Digital Spectrum Compatible HDTV (DSC-HDTV) system developed by Zenith Electronics Corp. and AT&T takes a different approach to achieving graceful degradation. As mentioned previously, the 4-VSB/2VSB system provides for either 4-level or 2-level modulation of the carrier.

The 2-level signal is more robust and can be received at lower signal levels than the 4-level signal, but the 2-level signal can only carry half the data of the 4-level signal. Either 2-level or 4-level data is used in transmission, with the ratio of 2-level and 4-level data adjusted dynamically, depending upon picture content. The 2-level data carries the most important picture information plus audio, with the 4-level signal carrying the remaining data that cannot be fit within just the 2-level data to make a high-quality picture.

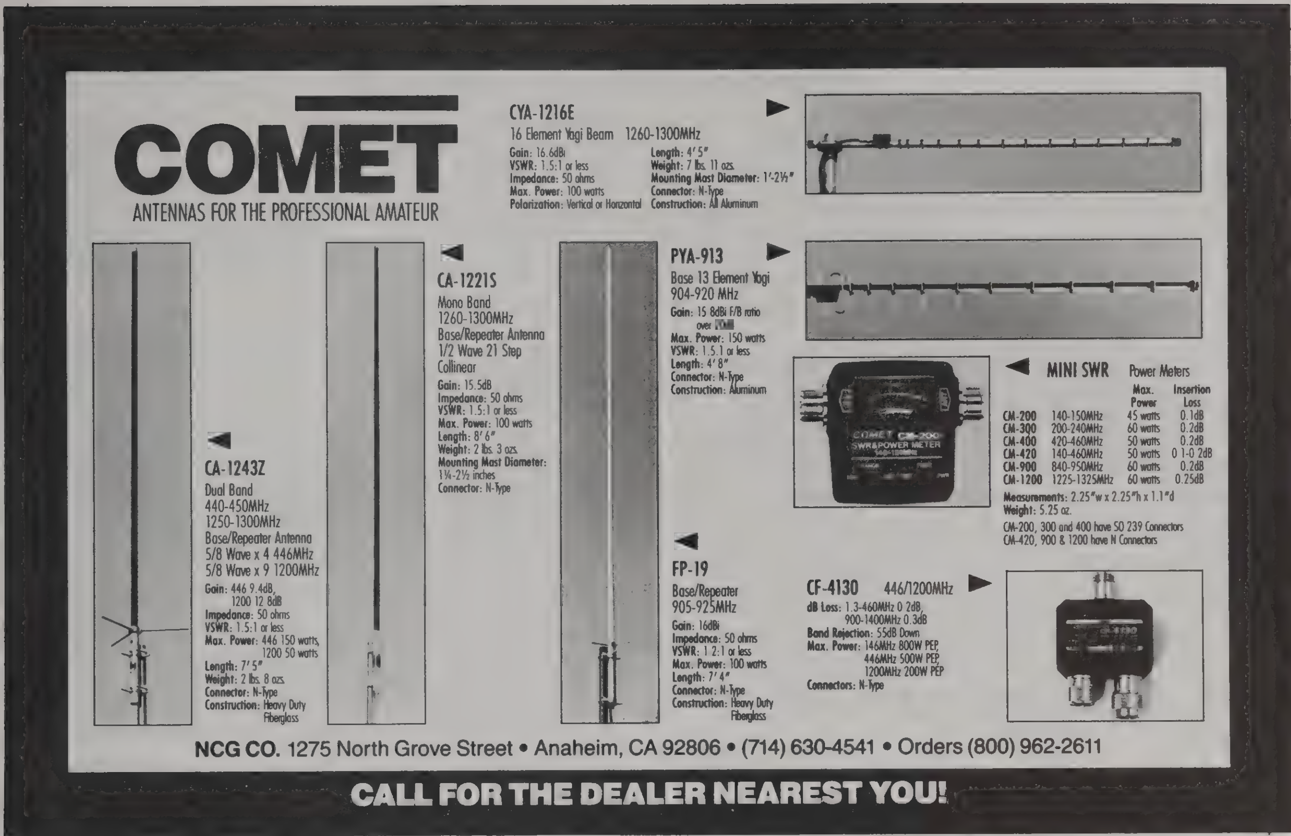
Because the proportion of 2-level and 4-level data changes depending upon the picture being transmitted, the total data rate varies with the proportion of the 4-VSB signal vs. 2-VSB signal that is sent for a particular image.

Thus, as mentioned earlier, there is a "maximum" data rate for the channel -- it is the rate when 4-VSB is sent. But the average data rate will never reach the maximum; it will lie somewhere between the maximum of 4-VSB and the minimum of 2-VSB, depending upon picture content.

Pilot Carrier Use

The DSC-HDTV system uses several other unique techniques to improve its performance in weak signal conditions or in the face of interference. One is the use of a pilot carrier to help lock the receiver demodulator, even under adverse signal and interference conditions. The pilot falls within the Nyquist filter rejection region of NTSC receivers. Another is the use of a time dispersion filter to spread out certain coherent pulses during transmission, thereby reducing their visibility on NTSC receivers.

The Narrow MUSE system, developed by NHK, the Japan Broadcasting Corp., splits the spectrum of the broadcast channel into two portions, above and below the NTSC picture carrier, with a gap in between them. The lower segment contains the higher energy, lower frequencies of the compressed Narrow MUSE baseband, which is a PAM stream carrying both



HDTV CONTINUED>>>>

compressed video and data for digital audio and control signals. The lower segment is modulated using vestigial sideband amplitude modulation.

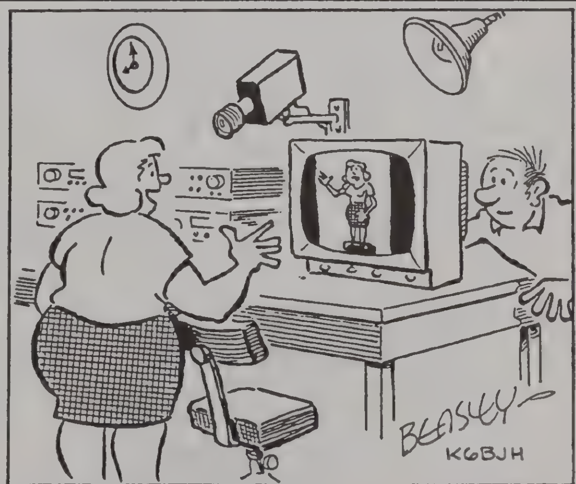
The upper segment contains the lower energy higher frequencies of the compressed baseband. It is modulated using single sideband amplitude modulation. The synchronizing signals are tri-level type, alternating in phase from line to line, and exist within the same amplitude space as the PAM modulation.

Implications for Transmitter Plants

We will have to wait for the next installment to delve into what all this means for transmitter plants. The kinds of things we will examine include the peak-to-average ratios of the system proposals, their power requirements for coverage equivalent to NTSC, and what they mean for: the sizes of transmitters, antennas, and power bills; the performance required from the various equipment elements and how that relates to current transmitter plant technology; and some of the tradeoffs that might be possible in the design of a facility and their implications for coverage area.

Until then, it probably would be a good idea to save this issue for reference in our discussion. In the meantime, if you have particular subjects you would like to see covered in this column, or if you would like to suggest priorities for coverage, please write to me c/o **TV Technology**.

S. Merrill Weiss is a consultant in electronic media technology/management. He has been an active participant in the FCC Advisory Committee on Advanced Television Service in the Working Parties on Systems Analysis, Economic Analysis, and Transition Scenarios. He is a Fellow of the SMPTE and is Certified by the SBE at the level of Professional Broadcast Engineer.



THERE, THERE IT IS--- YOUR HORIZONTAL WIDTH IS JUST RIGHT!

SHOOTING A VIDEO

By Graham Baker, ZL1TOF

I'll begin with a quick look at history. In 1833 W. G. Horner developed an apparatus called the Zoetrope, or wheel of life. It consisted on a cylinder with equally spaced slots. Inside were a series of sketches showing successive stages in the movements of, say, a walking man. When the cylinder was rotated the view through the slots had the appearance of vivid movement. Photographs were substituted for the sketches in 1872. Flexible film invented by George Eastman in 1884 laid the way to the movie camera patented by William Friese-Greene five years later. Few amateurs made movies until the end of the 1920s.

In 1937 after seven decades of improvements, Kodak made the first successful color process. A year later Agfa made a simpler color film. These two processes are the basis of all present day color photography. Amateur movie film had a format called Double Eight which provided the same quality as emerging television. Today the Super 8 system is available with an optional magnetic strip for sound and quality similar to Super-VHS video. A three minute Super 8 movie film costs about $41 including processing. This works out at about 70 times the cost of reusable S-VHS Video Tape.

Recently I visited a professional photographer who makes wedding and tourist promotion videos. As a sideline he transfers home movies to video and edits videos. These are some of his suggestions for amateurs to correct their common faults.

☞ Use a support to hold the camera steady. The effective shutter speed of a video camera is 1/25 second. For handheld 35 mm cameras the general rule is to use a shutter speed the same or faster than the focal length of the lens being used, otherwise use a support. When translated to video cameras this rule becomes: use a wide angle for hand held shots. Otherwise use a tripod or other support.

☞ Get in close and fill the view finder with your subject. Viewers expect to see the fine details in a landscape. If the image is large then fine detail is not needed and there are no distractions in the background to draw the viewer away from your subject. You pay for the whole picture so why not use it all?

☞ Plenty of light will give a sharper picture with fine details and greater depth. Sunlight is contrasty; the shadows become black with no detail. Illuminate the shadows with a fill light or reflector. Alternatively diffuse the sunlight through fine material. Many light sources make good heaters so watch you don't cook the subject.

The rest of the rules apply rigidly to video and movies. The first is a spin-off from the experience of movie film.

☞ Take at least five seconds on each scene. Think of the viewers; on first showing of a video or movie, it takes some time to take in a scene. But, do not spend the whole time on the same scene. Keep the program interesting by changing camera angles and close-ups. This conflicts with keeping the camera running and still. Later edit in some background material for additional scene changes.

☞ Keep the camera running. Many amateurs take photographs with their video and wonder why they miss the action. If you shoot a scene that is too long then it may be edited. The other problem is making a 30 minute program from three or four 180 minute tapes.

☞ Do not pan, or pan very slowly. The video camera has no shutter, except for some modern CCD camcorders, so all movement is blurred. Keep the camera still and shoot the action. This way the pictures are mostly sharp with acceptable blur associated with movement. Alternatively pan with the subject and blur the background.

For a specific video program it is a good idea to plan ahead. If there is no plan or theme the viewer is going to lose interest and your ideas will be wasted.

The plan consists of a commentary, music and a shot list. Using a word processor, write the story beginning with the main headings. Then fill out the sections as needed. Print the story using about half the width of the page so that there is room to sketch the scenes.

The first shots are usually a title scene which tell the viewer what he can expect to see or learn about in the rest of the video. The simplest titles are made by drawing on card. Recently electronic titling in its various forms has been built into some cameras or may be generated by computer programs.

Continued.......

SHOOTING

..........Continued

Scrolling titles have been used for years and this will put the finishing touch to any movie. Simply use a roll of paper or printer on form feed to move the titles past the camera. Mixing the titles with scenes can be difficult with video. Don't forget to put a finish to your work.

The commentary for the video can be read but is usually more fluent if notes are used and the rest is off the cuff. Needless to say the commentary should be related to the scenes, and depending on the subject, may be better if broken into short bursts and the pictures left to tell the story. The spaces may be filled with music but remember the original sound track may help with realism.

If plenty of time is spent in the planning stage, then your video will be remembered for its content and not the usual amateur qualities of long, shaky and boring.

Finally, the video cassette needs to be documented. Title, Author, Date, Running Time and Issue Number if there is more than one copy. That's what all the labels are for. It would be a sad shame to lose many hours of effort by recording a TV show over your program. Don't forget to knock out the recording tab to prevent accidental erasure.

A CHEAP & DIRTY WEATHER COVER FOR MOUNTED PREAMPS & DOWN-CONVERTERS

(author didn't sign his letter! but its a good idea!)

As an avid ATV experimenter and promoter, there is generally a continuous flow of equipment through the WA7DRO hamshack. I have a general rule that homebrew antennas never cost more than ten dollars, nor stay in service more than a couple of months. I like to mast mount my preamps and down-converters, they go up and down on a weekly basis for television demos and mobile operation.

Keeping rain induced moisture out of the mast mounted die cast boxes has always been a challenge despite several layers of electrical tape and obscene amounts of clear polyurethane spray paint over the tape.

An elegantly simple solution to the problem involves the venerable polyethylene milk jug.

I cut the bottoms out of two one gallon milk jugs. On one I further snip off the bottom corner closest to the handle, then slit the container from this corner through the handle to the threaded top. Placing the die cast box inside this container, and slipping its wires through the slit into the handle, this becomes the bottom half..

Next, I slip the top half over the bottom half. If any difficulty is experienced, four 1" cuts on the corners corrects the problem. The bottom lid may be screwed on around the wires by making a cut from the outer edge to the center then removing an appropriate sized circle from the center.

The same general principles may be used on smaller plastic containers for smaller weather covers.

Better temperature stability for down-converters can be obtained by filling the milk jug with styrofoam and during cold weather, letting it run continuously.

Do you need something to keep that hanging BNC dry in a rainstorm while you are working on the preamplifier? Then tape an inverted pop can to the mast, and stuff the connector through the hole.

In this age of submicron, pseudomorphic high electron mobility, quantum wells, molecular beam epitaxy, ion implanted, mill specked, EMP proofed, radiation hardened, video compressed, millimeter wave, 32 bit massive parallelism that we live in, FREE is a VERY GOOD PRICE! So finish your milk, guys!

THE MAG WHEEL
By Dave Clingerman, W6OAL

Many products of our times go through what we could call an evolution or even a rebirth. Antennas both amateur and commercial are no exception. I was a big fan of the "Big Wheel" back in the '50's when it was created for use on two meter SSB where horizontal polarization was needed, and specifically for mobiles the feature of omni-direction. I, unfortunately, never had the funds to acquire any two meter sideband equipment back then. Many of us I suppose were born poor and naked. It was a pretty nifty, neat and different looking antenna and a fine piece of engineering to the credit of Amateur Radio.

So, in the early '90's, 40 years after the creation of the "Big Wheel", its notoriety for the most part, had passed into obscurity– a need arose for an omni-directional antenna that was polarized horizontal for portable and mobile Amateur Television (ATV) work in the 70 cm band. Guess what turned out to have the most attractive features, after messing with Turnstiles and Haloes and Squalos, you name it. All alternatives to the scaled down "Big Wheel" produced huge nulls, a lack of gain and just general disappointment and inadequacies. All of a sudden now the "Big Wheel" wasn't so big (and obtrusive to some) anymore when redesigned for use at three times its original design frequency. It became a "Little Wheel"! That obtrusive, 40 inch diameter "bird scythe" had become a cute little 13 inch diameter creation of modern art. They would probably make a nice "mobile". And so the evolution proceeds, from the "Big Wheel" that was at one time so popular among two meter, SSB, mobile operation enthusiasts to the "Little Wheel" that many have come to learn of, use and swear by. Through many stages of development (trial and error), the next generation ensued–the "New Wheel"–made its appearance. This was the placing of a more robust "Little Wheel" on the end of a length of hardline and fitting a connector on the other end. Mounting was left up to the customer. Now due to customer requests, another version of the "Little Wheel" has evolved. This new product/creation is to be known as the "Mag Wheel".

As more and more HAMS are getting into more exotic modes of communication due mainly to availability of equipment such as ATV, and our hobby becomes more and more portable so goes some form of antennas. The problem as usual, how do we fasten that darn thing to the vehicle? Wife catches you with a hand drill near the new car and your dead meat! Well, Duct Tape might suffice, however, the removal thereof may cause the paint to come with it (dead meat again). There has been an influx of magnetic mountings for antennas over the past couple of years, a few of these holding up some fairly massive arrays. Along with the convenience of mounting is also the convenience of quickly dismounting which affords the security of being able to lock your antenna inside the vehicle when parked.

So now the "Little Wheel" and the "New Wheel" has evolved into the "Mag Wheel" or a magnetically mounted "Little Wheel". How this came about was at one of the recent hamfests here in Colorado I was perusing the products offered by Antennas West of Provo, Utah. They have some very impressive mag-mounts. I asked where he acquired his magnets which I found interesting by the fact that they were very strong for their size. I was told that the supplier was none other than Lakewood Company, Inc. in Anderson, SC. I ordered a few of the 3" variety and proceeded with my design.

By virtue of the fact that an extra 3 dB of gain can be acquired of an antenna system that is horizontally polarized if the antenna such as a yagi is placed ⅝ λ above a good ground plane. According to theory, at this height an image antenna appears at the surface of the ground plane. Image or actual the addition of a second radiator to an array similar to the first will produce a 3 dB increase in gain, minus the normal losses, of course. This was my rhetorical and theoretical basic building block. Next, I created a "Little Wheel" (similar to the "New Wheel") on the end of a 19.5" (1 λ_{coax} @ 70 cm) length of ¼" hardline that has a velocity factor of 0.70. The free space dimension of 5/8 λ at 70 cm is approximately 17". Some judicious bending of the hardline, taking into account the thickness of the magnet, will place the "Little Wheel" at the proper place above the ground plane. I used a bulkhead mount type "N" female connector that is made to be compression fit on ¼" hardline. This connector is then mounted to a brass "L" bracket having a ⅝" hole in one end for the connector and a ¼" hole in the other for mounting to the magnet.

The increased horizontal directivity from the image (3 dBi) combined with the normal gain from the "Little Wheel" (2.15 dBi) will yield a gain over isotropic of about 5 dB. These antennas do not necessarily have to be used for ATV as they work very nicely at 432.1 MHz on SSB. Generally the band width (2:1 VSWR points) will be on the order of 20 MHz, more than sufficient for ATV and wide enough to use the same antenna for ATV and SSB (420 - 440 MHz).

ELECTRONICS

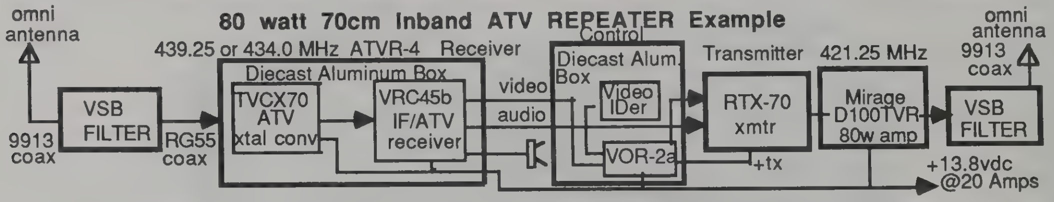
P.C. ELECTRONICS 2522 PAXSON LANE ARCADIA CA 91007-8537 USA

TOM (W6ORG) & MARYANN (WB6YSS) O'HARA (818)447-4565

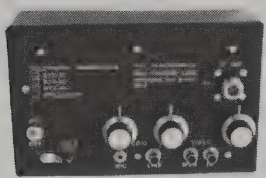
24 hr **FAX** order line (818) 447-0489 VISA

READY FOR AN ATV REPEATER OR LINK IN YOUR AREA?

WE HAVE THE MODULES AND SOURCES FOR INBAND OR CROSSBAND



Select an RTX Transmitter and a ATVR Receiver for the bands you want, add the appropriate linear amp,VSB filters & antennas, ID & VOR-2a, power supply and coax for your own repeater. We suggest low in / high out for crossband. Ask for a copy of our ATV Repeater article before you start so you will do it right the first time. Also listed are recommended sources of filters, antennas, IDers, etc. Most can put together a good working ATV repeater for under $2000.



TRANSMITTERS ready to go in a 7.3x4.7x2 die cast aluminum box for tight RF shielding. >1 Watt p.e.p. output for proper drive to companion amplifiers. Adjustable sync stretcher to enable set up of the right video to sync ratio after an amplifier is added. Independent mic and line audio inputs. Requires 13.8 Vdc at 500 ma.

RTX-70 specify output frequency, 421.25 MHz most popular rptr. output **$299**

MIRAGE D100ATV-R 90 Watts p.e.p on ATV continuous duty 70cm repeater amplifier see page 2 for more info and picture **$519**

RTX-33 specify frequency - 923.25 MHz most used frequency **$329**

RTX-23 specify frequency - 1253.25 MHz best first repeater output frequency....**$329**

We suggest Downeast Microwave for 900 MHz (3318PA) and 1200 MHz (2318PAM or 2335PAM) repeater amps to match our transmitters. Call them at (207) 948-3741.

RECEIVERS ready to go in a 7.3x4.7x2 die cast aluminum box for tight RF shielding. Contains a TVCX crystal downconverter and VRC-45b receiver. Two composite video outputs, squelched speaker and line audio outputs. Requires 13.8 Vdc at 300 ma.

ATVR-4 specify frequency - 439.25 or 434.0 most popular for inband or crossband repeater input..........**$299**

ATVR-9 specify frequency - 910.25 most popular repeater input..........**$309**

ATVR-12 specify frequency - 1253.25 link, 1277.25 repeater input..........**$329**

VOR-2a Video Operated Relay board...$45, keys RTX upon detection of horizontal sync plus 10 min. & end of transmission momentary relay for switching to video ID to meet FCC regs. Now with pots for input sensitivity, tx hang time and 10 min. ID time. Noise imunity improved. See review in July 91 73 Magazine page 26.

LMB CAB 247 7.3x4.7x2 die cast aluminum box. Great for housing VOR-2a and video ID boards...**$20**

ANTENNAS When comparing prices remember ours include delivery by UPS surface in contiguous USA.

F718 Diamond vertical omni 9.3 dBd gain, 15 ft long. Specify 70cm video carrier frequency........**$219**
440-6X KLM 8.9 dBd gain 420-450 MHz 6 element beam. 28" boom, end mounted..........**$59**
440-10X KLM 11.2 dBd gain 420-450 MHz 10 element beam 64 " boom, end mounted..........**$72**
440-16X KLM 14.2 dBd gain 420-450 MHz 16 element beam 10.5 ft boom, center mounted.......**$129**
FO22-ATV RUTLAND 15.8 dBd gain 420-450 MHz 22 element beam 14 ft boom, center mtg......**$105**

FP-19 Comet vertical omni10 dBd gain, 7 ft 4 in long. Covers 902-928 MHz..........**$109**
3318LYARM Downeast Microwave 14.2 dBd gain 902-928 MHz beam. 6 ft boom, end mounted....**$82**

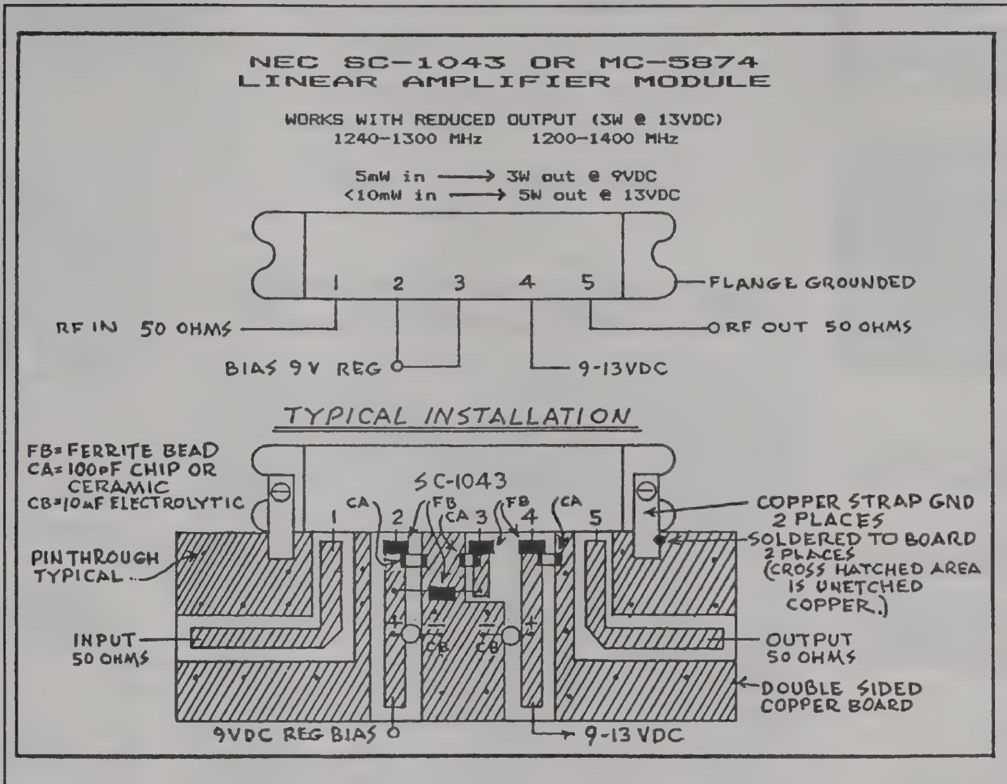
F1230 Diamond vertical omni 11.3 dBd gain, 10.5 ft long **$159**
2424LYRM Downeast Microwave 16.2 dBd gain 1240-1300 MHz beam. 6 ft boom, end mounted..**$82**

DOWNCONVERTER DISCOUNT of 10% is available to Repeater groups and clubs if you order 5 or more per item of the tuneable downconverters Special discounts for Teacher Hams - call. The order must be sold and shipped to one person at one time. It helps to have some extras available for new people to try out your repeater or use at demos at other clubs and schools. All downconverters have a GaAsfet preamp and mixer for low noise and high dynamic range. Get a board if you want to package your own - you will need a shielded cabinet with knob, switch, connectors and 11 to 14 Vdc power supply. Or get one ready to go. **5/92**

TAMING THE SC-1043 BRICK

By John, WA8EOY

from the ATCO newsletter



Dave, W8AER, asked me if I would fix his mast mounted 1260 MHz transmitter. The transmitter consists of a P. C. Electronics test oscillator which has an output of 50 mw at 1240-1300 MHz modulated for AM or FM. This unit is matched to a SC-1043 brick which develops a 5 watt output at 50 ohms and is a common arrangement in the ranks of ATVers.

This combination of units has a reputation of being unstable and changes frequency at random, and Dave's unit was no exception. Improvement of this condition is made by replacing the capacitor that tunes the strip line of the oscillator with a piston capacitor. I did this only to find that the unit would output only 1050 or 1350 MHz. I disconnected the oscillator from the brick and ran it independently. I set it at 1280 MHz and ran it for 30 minutes. The change was only 216 KHz. Then I reconnected the oscillator to the brick and found that the output was 1350 MHz! I then found a place on the oscillator board where I could read its frequency, and it was 1280 MHz! Therefore, since I found that the brick was oscillating under drive conditions, it should be replaced.

Based on my findings, Dave decided to purchase a SC-1043 from Down East Microwave and a different schematic diagram than previously used came with it. The schematic is included with this article. The basic difference shown on the new schematic is that pin 2 and pin 3 are wired together close to the brick terminals with a ferrite bead on the wire. Chip capacitors are used but not necessary; electrolytics are smaller in value, and bias voltage is 9 vdc as opposed to 7 vdc. I rewired Dave's unit as shown in the schematic accompanying this article, and the results were astounding!

The unit was tested at 1262.3 MHz, 11 vdc, and 5 watts output for 30 minutes. The results were that the frequency had drifted down 1.1 MHz, the brick's temperature was ambient, and the heat sink was just warm. I hope that this new schematic will help ATVers to get on 1200 MHz television and get Dave, W8AER, on 1200 MHz in the morning sessions.

10 GHz for Amateur Television

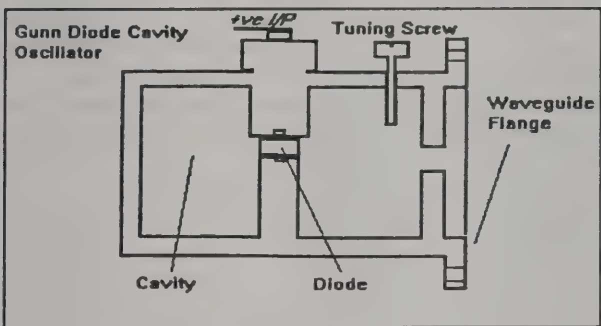
Steve Walsh G8KUW

The TV Amateur will, at some stage, probably want to try experimenting with 10 GHz FMTV. The next "upgrade" to GB3ZZ will be a full featured 10 GHz repeater to be co-sited with GB3Z. The call sign GB3AA has been resurrected for this purpose.

Microwave technology has always been regarded as something of a 'Black Art' by those who do not work in the industry, as I work in the industry, I do not necessarily hold this opinion but I would not like my boss to think my job was too easy, so I won't disabuse him of that belief! The theory behind most aspects of microwave technology can be somewhat daunting, but as with most complex issues, it can be brought down to basics quite simply. In this article I will relate some of the results of my recent experiments with microwave oscillators that may be of interest to the TV Amateur considering 3 cm operation.

To transmit a TV picture at 1 Eights, some way of generating a carrier at that relatively high frequency must be sought. The simplest way is the Gunn Diode Cavity Oscillator.

The Gunn Diode Cavity Oscillator



This is a very easy means of generating a 10 GHz (X band) carrier. These devices have been readily available for a number of years due to their popularity as burglar alarm doppler detectors. Companies such as Solfan produce heads that may easily be tuned to the amateur band. These oscillators are not particularly stable, both supply voltage and temperature have a large influence on frequency, so these devices are not very suitable for narrow band work.

How it works....

It may be of interest to know how the device works and some of its limitations. The Gunn Diode has a very thin junction of n-type Gas (Gallium Arsenide). When a relatively large electric field is placed across the very thin type layer, the negative resistance diode produces coherent microwave oscillations. The effect is due to the charge carriers in the semiconductor forming domains, these move down the potential gradient at a speed determined by the charge carriers' mobility. The fast moving domains form fields called TE mode waves in a suitable cavity, and microwave energy is present at the output of the cavity. The cavity is usually formed by a closed end section of wave guide that conveniently mates to any other section of X band wave guide or circulator. This forms the basis of a very low power (5 mW) transmitter.

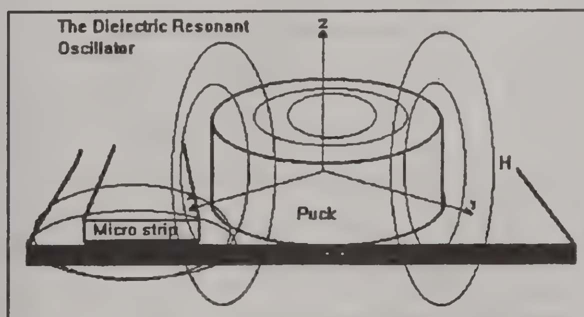
The cavity is mechanically tuned by a screw threaded trough the side wall thereby altering the resonant frequency of the cavity, because the stored energy near the side wall is predominantly magnetic, turning the screw in will raise the resonant frequency. Another large influence on frequency is the supply voltage, because the voltage forms the electric field across the *fixed* width n-type layer, the potential gradient is a direct function of supply voltage .

This effect can be utilized when building an FM transmitter, frequency modulation is achieved by altering the supply voltage very slightly. The most common way of modulating the supply voltage is to vary the base current of a transistor placed in the ground leg of a standard 78LM05 voltage regulator. Gun diodes usually require between 6 and 7 volts depending upon type, and an applied voltage either more or less than the required voltage will easily damage the device. If a potential of less than 6 volts is applied, the negative resistance region of conduction will not be reached and consequently a large current will flow through the diode (up to 250 ma), if a voltage greater than 7 volts is applied, then the junction breakdown voltage will be exceeded and certain damage will result.

The Dielectric Resonator Oscillator

This device is becoming very common these days with the advent of Satellite TV broadcasting. Almost all Low Noise Block down converters (LNB's) use DROs as their local oscillator. The simplicity of design and relatively good stability means that the TV amateur can readily make use of these devices in designing transmitters and receivers.

The Dielectric Resonant



How DRO works....

How these bits of ceramic we refer to as PUCKS determine the frequency of an oscillator is very interesting. The most common form of ceramic used to make these pucks is Alumina (Al_2O_3), however in order to obtain the highest Q, some designers use more exotic compounds such as Titanates . The ideal resonator has a very high Q, low loss, and high permittivity. Pucks are available in a variety of shapes including rods, plates and cylinders or discs. The commonest shapes you will see in DROs are discs. As can be seen from the diagram, the puck has the usual E and H

(electric and magnetic) waves of stored energy, and providing the H field from an adjacent micro strip is coupled to the resonators' H field, the pucks' natural resonant frequency of the puck dominates the otherwise free running oscillator. The frequency is determined by the physical dimensions of the puck and by its surroundings. By using some very complex Maxwell equations the frequency may be predicted during manufacture, more usually, the frequency is closely approximated by machining and the fine tuning obtained by mechanically tuning the cavity the microcircuit is inside.

The microcircuit will often be a GasFET transistor micro strip amplifier with heavy positive feedback, causing it to oscillate. The stray capacitance and micro strip inductance determines the free running frequency, usually designed to be slightly higher than the wanted frequency.

Circuit theory....

Coupling the H field of one or both micro strip elements into the TEo1 mode of the puck is done by carefully positioning the DRO element and then fixing it in place by some form of glue. The glue does not have the same permittivity or dielectric constant as the puck so will not normally affect the frequency. 'Super glue' or nail varnish works well. Many designs are to be found for making a DRO oscillator. The simplest design is the one outlined above, where the DRO puck is a parasitic element as shown in fig.3, but the puck may also be configured to be the circuit feedback

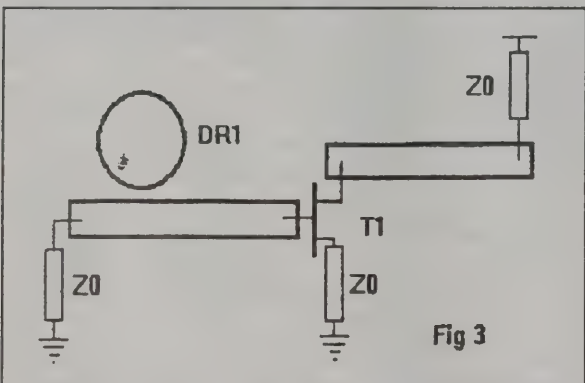


Fig 3

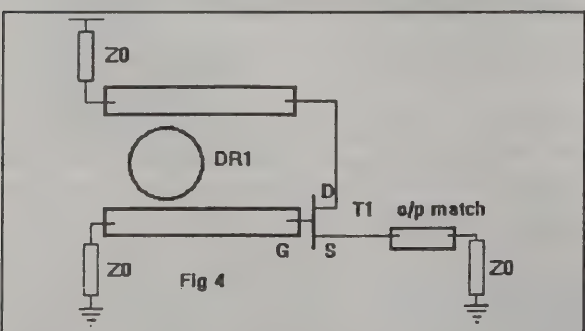


Fig 4

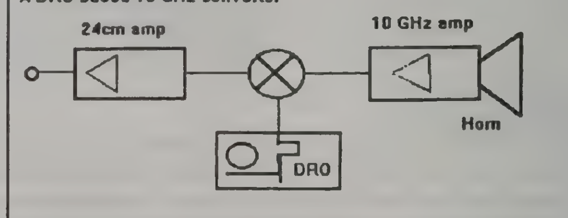
element coupling the positive feedback from the drain strip line to the gate strip line as shown here.

This type of oscillator is ideal as a fixed frequency local oscillator, but it is also possible to electrically tune the frequency. As varicap diodes are of little use at this frequency, there are only two methods that may be utilized by the TV amateur due to cost constraints. The method chosen depends on the amount of frequency deviation required . The first method of frequency control is obtained by varying the bias on a varactor diode that is mutually coupled to the resonator. The amour; of coupling applied determines the range of frequency variation, but it can be typically 1% of fundamental. This is more than enough for FM TV and therefore this method of control would more effectively be used for applying a phase locked loop control voltage to the oscillator, or even DC tuning.

The second option offers only 0.1% deviation from centre frequency, but is easier to realize, and lends itself readily to FM TV. It relies on the fact that an oscillator is frequency sensitive to variations in the bias fed to the GasFET device. Modulating the transistor bias voltage with pre-emphasised video makes the basis of an ideal 10 GHz TV transmitter. The control range is still wide enough to apply phase locked loop control with minimum phase noise on the carrier. The DRO oscillator is relatively immune to drift due to temperature, resonators are available that offer drifts of less than 200 ppm over -55 to + 85 degrees C. The strip line design allows easy connection into a strip line MMIC amplifier circuit, or if desired the < 10 dBm power from the oscillator can be fed directly into the antenna system.

There are a few companies that will supply DRO pucks to the amateur market, but prices do vary, so shop

A DRO based 10 GHz convertor

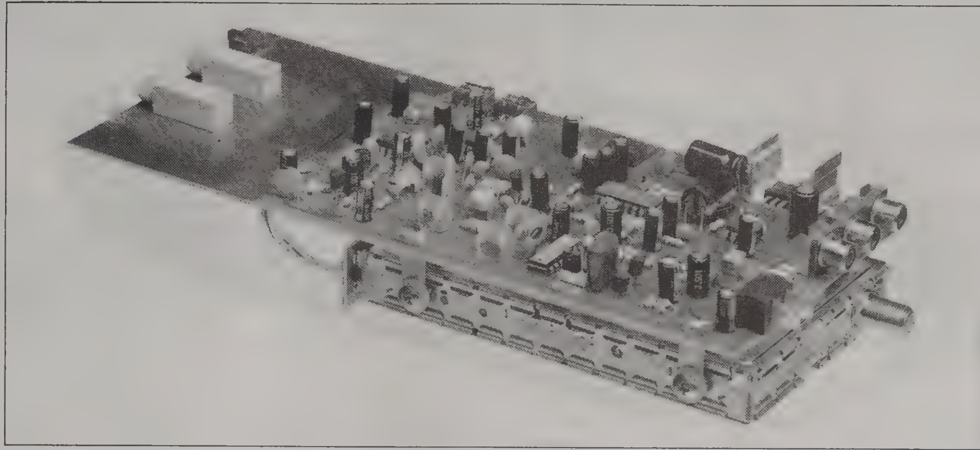


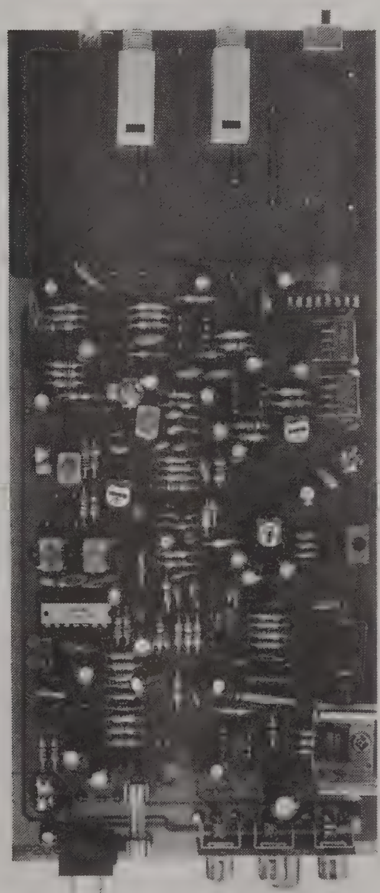
around. We can usually expect to pay between 9 and 12 for just one puck, and the most common frequency ordered is 9.1 GHz. This is because we normally transmit 10 GHz TV on 10.250 GHz, if the local oscillator in our receiver is chosen to be 9.1 GHz, our IF will be 1150 Mhz. This may then be fed to an existing 24cm TV receiver to form a complete 10 GHz receiver.

If you choose not to adopt this method of reception, it is very easy to modify an existing satellite LNB for this purpose simply by changing the puck inside the LNB and, if necessary, slightly extending the tuned lines in the LNBs front end GasFET amplifier. The Ku band wave guide dimensions are slightly different to X band wave guide sizes, so you will normally need to fabricate a wave guide convertor if you wish to adapt the LNB to an existing X band horn or dish.

For more details on modifying the 'Sky scan' LNB refer to CQTV 152 or the ATV Compendium (a BATC publication). Call Oakbury Components on 0635 521077 for prices on their Siemens 38DRO9.10 9.1 GHz pucks.

EURO 600 SAT MODULE





: + 17,5 V DC

: 400 mA LNB

: Type F connector

: 950 - 2000 MHZ ADJ.

: 5,2 - 8,3 MHZ

: - 65 dBm

: 6,5 dB

: Switchable (on,off)

: 16/27 MHZ switchable

: 50 HZ - 5 MHZ

: Pal/NTSC/SECAM CCIR 405-1

: neg/pos. switchable

: 1V P/P ADJ.

: RCA Femelle

: RCA Femelle

: RCA 50 HZ - 8,5 MHZ

PICOTRONIC
Inh. H. Boertzler • Zollamtstraße 48
D-6750 Kaiserslautern • W.-Germany
Telefon 06 31/2 91 87 • Fax 49-6 31/2 95 79

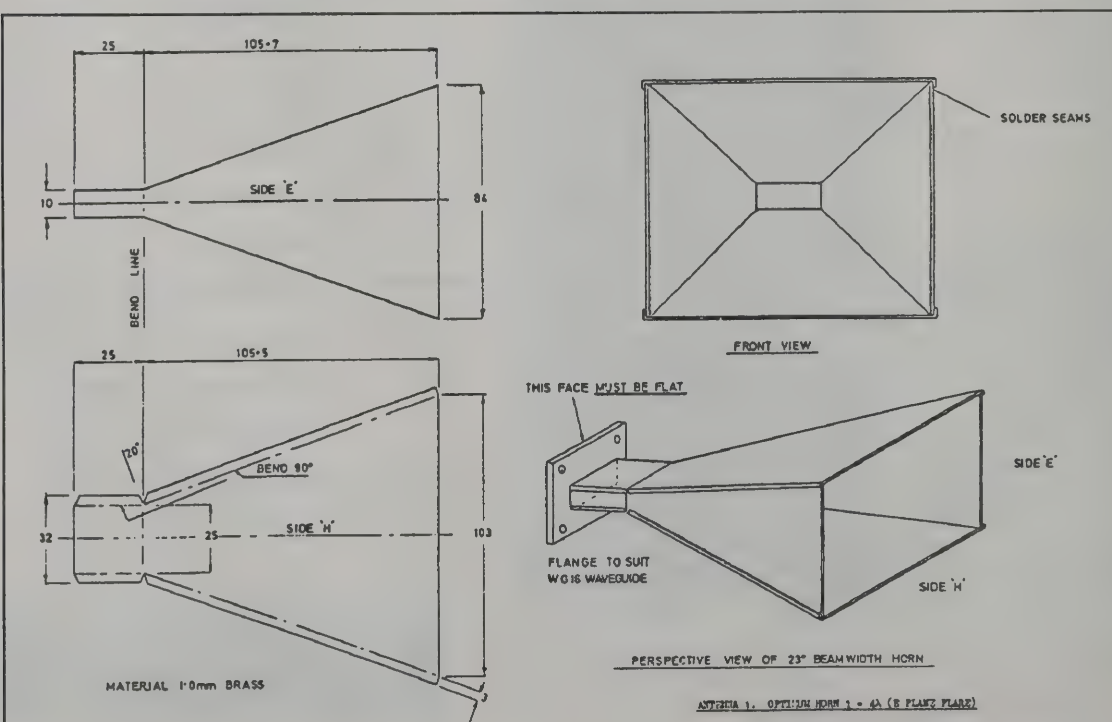
HORN AERIALS FOR 10 GHZ
By John Hudson, G3RFL

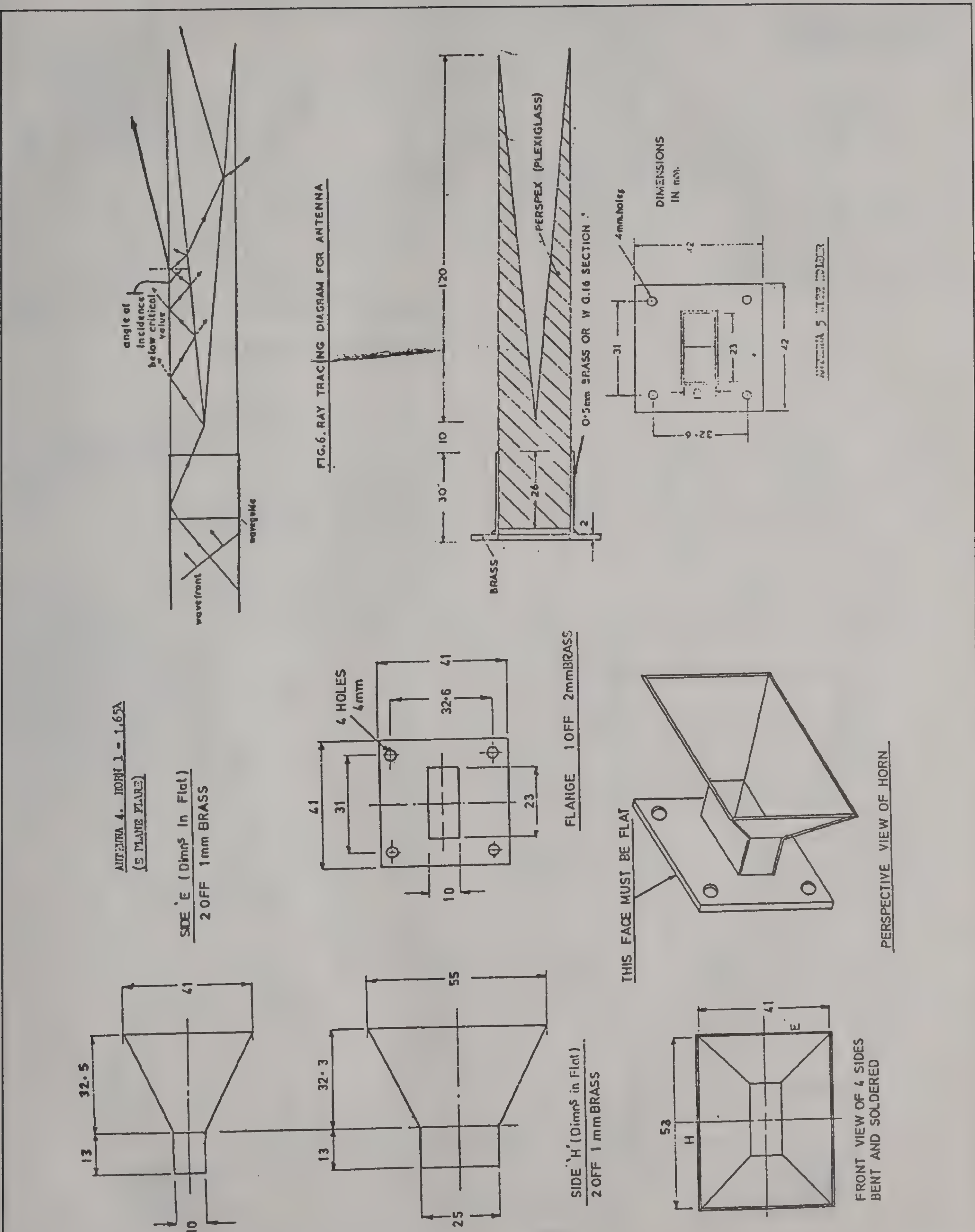
We are grateful to our new committee member, John, G3RFL, for the following details of 5 designs for 10 GHz Horn Aerials. These have been extracted from a longer paper on the subject, which gives some more background information on the subject. If anyone is interested, John or myself could fill in the missing information.

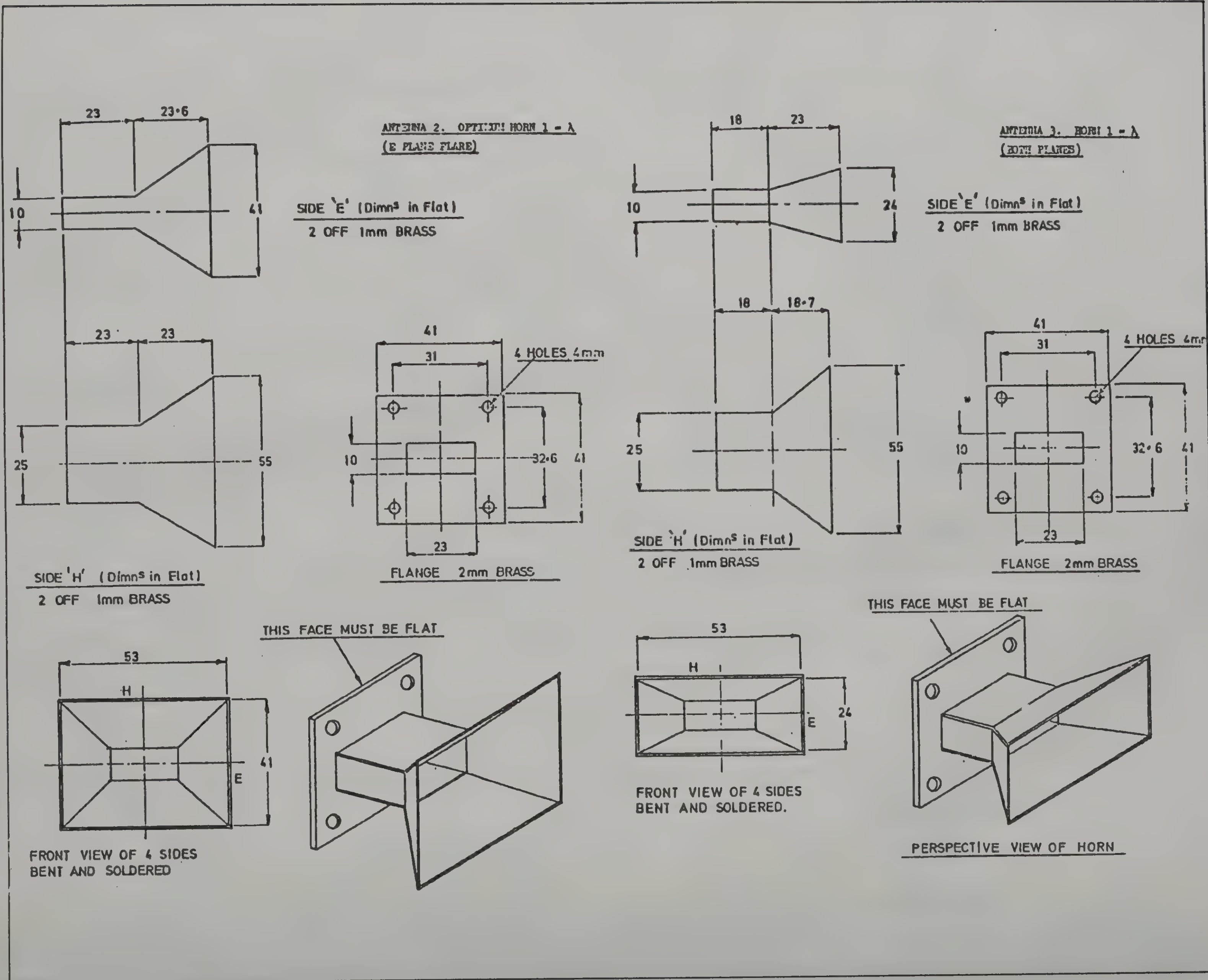
<u>Results: f = 10.70 Hz</u>

Antenna Description	Ref. No.	V.S.W.R.	Abs. Gain *	Half-power Beamwidth	
				H Plane	E Plane
Optimum horn, 1 = 4λ (E plane flare)	1	1.20	18.0	23°	16°
Optimum horn, 1 = λ (E plane flare)	2	1.27	13.2	40°	30°
Horn 1 - λ (Both planes)	3	1.17	11.2	40°	50°
Horn 1 - 1.65λ (E plane flare)	4	1.3	13.5	30°	30°
Dielectric Antenna	5	1.15	15.6	24°	27°

* Note: Absolute gain is that referred to an isotropic radiator or one which radiates equally in all directions.



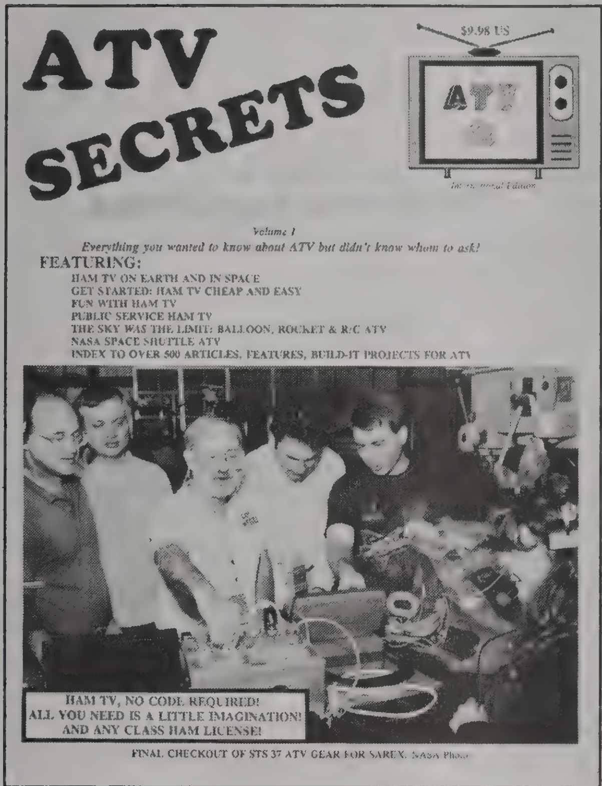

ANTENNA 4. HORN 1 - 1.65λ
(E PLANE FLARE)
SIDE 'E' (Dim^s in Flat)
2 OFF 1mm BRASS
SIDE 'H' (Dim^s in Flat)
2 OFF 1 mm BRASS
4 HOLES
4mm
FLANGE 1 OFF 2mm BRASS
THIS FACE MUST BE FLAT
PERSPECTIVE VIEW OF HORN
FRONT VIEW OF 4 SIDES
BENT AND SOLDERED
angle of
incidence
below critical
value
wavefront
waveguide
FIG.6. RAY TRACING DIAGRAM FOR ANTENNA
PERSPEX (PLEXIGLASS)
0·5mm BRASS OR W G.16 SECTION
BRASS
4mm holes
DIMENSIONS
IN mm.

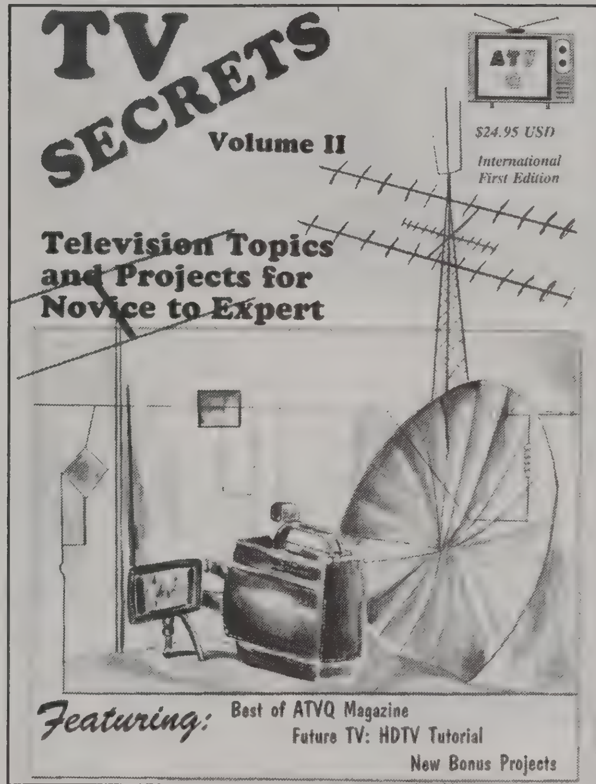

ANTENNA 2. OPTIMUM HORN 1 - λ
(E PLANE FLARE)
SIDE 'E' (Dimns in Flat)
2 OFF 1mm BRASS
SIDE 'H' (Dimns in Flat)
2 OFF 1mm BRASS
FLANGE 2mm BRASS
4 HOLES 4mm
THIS FACE MUST BE FLAT
FRONT VIEW OF 4 SIDES
BENT AND SOLDERED
ANTENNA 3. HORN 1 - λ
(BOTH PLANES)
SIDE 'E' (Dimns in Flat)
2 OFF 1mm BRASS
SIDE 'H' (Dimns in Flat)
2 OFF 1mm BRASS
FLANGE 2mm BRASS
4 HOLES 4mm
THIS FACE MUST BE FLAT
FRONT VIEW OF 4 SIDES
BENT AND SOLDERED.
PERSPECTIVE VIEW OF HORN

ATV BOOKS

THE BEST OF BOTH WORLDS

NON TECHNICAL | **TECHNICAL**





ATV SECRETS volume one, for aspiring ATV'-ers, as reviewed in the October 1992 issue of QST, is a great place to start your ATV adventure. Its 64 pages are tightly packed with succinct information to cover all aspects of getting started, where to find activity, equipment, how to DX, and answers frequently raised questions of power, antennas, vestigial sideband operation and more. It also includes an index to over 500 items which have appeared in ATVQ Magazine's first four years. From ATVQ, $9.95 plus $1.50 post (US, $1.90 (Canada) $2.90 (DX).

TV SECRETS volume two, for advanced ATV'ers, as published in the October 1992 issue of QST, is a mammoth book, with over 280 pages of technical material. Over 40 authors present over 90 technical projects and theory topics to fully acquaint anyone from novice to expert in the how and what of TV, video and ham TV. Divided into 11 chapters, the book presents tested projects for all areas of interest in ham TV including antennas, amplifiers, repeaters, receivers, transmitters, video accessories and more. $24.95 plus $2.90 post (US) $3.80 (Canada) $6.50 (DX).

ORDER TODAY! Name ____________________

address: ____________________

City ____________ State ____________ ZIP ________

Country ____________ Visa/Mastercard # ____________ Expires: _____

Signature: ____________ Quantity: Vol I ______, Vol II ______

ATVQ, 1545 LEE ST., DES PLAINES, IL 60018. FAX 708 803 8994, VOICE 708 298 2269

ATV BOOKS

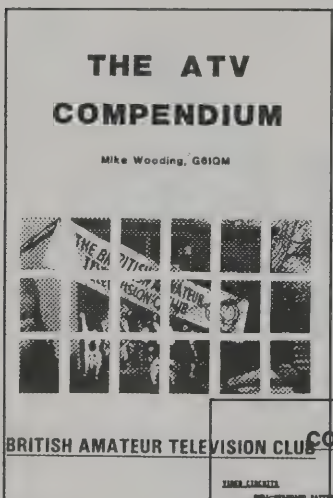
From the BATC available through ATVQ

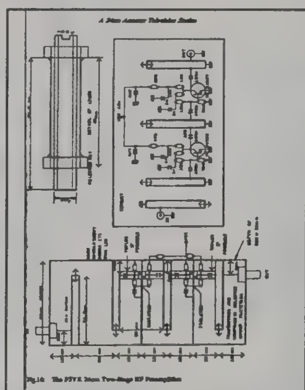
ATV COMPENDIUM

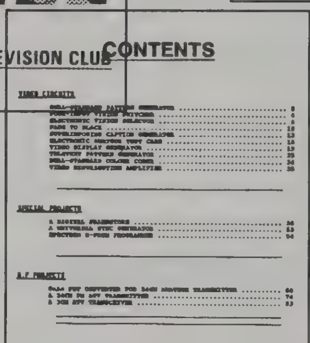
104 pgs. 8.25 x 5.75 1989
A collection of projects and useful topics from issues of CQ-TV, compiled by Mike Wooding G6IQM. A high quality work with projects that work in both NTSC and PAL video systems. This book is OUT OF PRINT, but a limited quantity of copies are available from ATVQ at $12.50 POST PAID. Do not order after Jan. 1, 1993.

AN INTRODUCTION TO AMATEUR TELEVISION

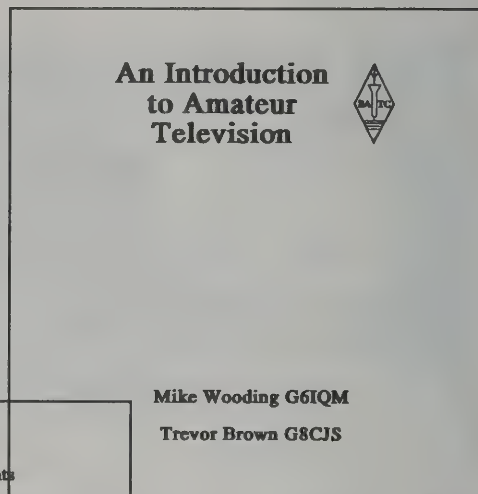
154 pgs. 8.25 x 5.75 1992
A collection of projects and useful topics including 24 cm ATV and a modular remote control station. Written and compiled by Trevor Brown G8CJS and Mike Wooding G6IQM. A high quality work. Available from ATVQ for $16.95 POST PAID.

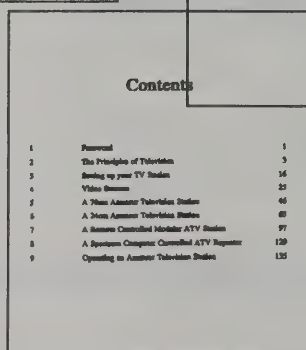






$12.50 post paid from ATVQ





$16.95 post paid from ATVQ

ORDER FORM: Name: ______________________

Address: ______________________
City ______________ State ______________ ZIP ______________
COPIES: Compendium ________ Introduction: ________
VISA/MASTERCARD # ______________________ EXPIRES: ______________
SIGNATURE: ______________________

INSTANT ORDER TAKER:
PHONE ORDERS: 708 298 2269. FAX 708 803 8994, MAIL 1545 LEE, Des PLaines, IL 60018 USA
Mailed as 4th class printed matter, faster methods post extra. 3.5% bank fee added to charge orders.

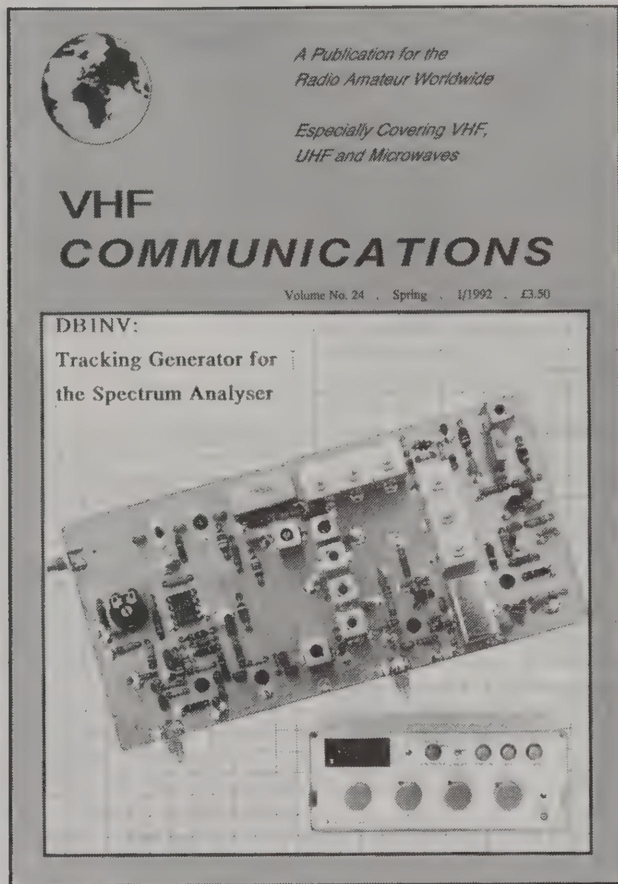
ATV MAGAZINES

international

CQ-TV | **VHF COMMUNICATIONS**

A quality quarterly publication covering mostly British ATV activity, club news and usually several good technical projects per issue. Typically 100+ 5.75 x 8.25 pages per issue. Most projects will also work or can be adapted to NTSC standards from PAL.

USA readers may subscribe via ATVQ for $21/yr which includes all foreign funds exchange fees.



A high quality technical publication with little news, almost entirely technical projects for VHF, UHF and microwave bands. Frequent projects for ATV operation on these frequencies. Publication also offers a number of kits for readers, based upon projects published. Probably the best technical ham radio magazine today. Authors are from most European countries.

USA readers may subscribe via ATVQ for $27/yr which includes all foreign funds exchange fees.

ORDER TODAY! Name ______________________________

Address: ______________________________

City: ______________ State: ______________ ZIP ________

Country: ______________ Visa/Mastercard # ______________ Expires: ________

Signature: ______________ Years: CQ-TV ________, VHF Communications ________

ATVQ, 1545 LEE ST., DES PLAINES, IL 60018 FAX 708 803 8994, VOICE 708 298 2269

The #1 ATV magazine in the world invites you to RENEW or SUBSCRIBE This is your 'Q':

Unless noted otherwise, all subscriptions start with the current issue.

* AMATEUR TELEVISON QUARTERLY (ATVQ) SUBSCRIPTION FORM:

Rates:	US	CANADA	DX
1 yr	$18	$22	$29
2 yr	33	40	54
3 yr	48	58	79
4 yr	63	76	104
5 yr	75	94	125
LIFE	360	440	500

NOTE: rates effective April, 1992

DX and LIFE rates REDUCED!!

Due to increased circulation we are able to reduce DX and life rates!

NAME ______________________ CALL:____________ PHONE____________

STREET:______________________

CITY:______________ STATE/PROV:________ ZIP:__________ +4________ COUNTRY:________

Voice coordination frequency for ATV in your area? ____________

Amateur Television Quarterly (ATVQ)

Your quality authoritative accurate source every issue. Yes, enter my subscription to Amateur Television Quarterly. I've enclosed a check or money order. Or bill my Visa or M/C: #______________________ expires:____________. sign name here:______________________

OTHER PUBLICATIONS AVAILABLE THROUGH ATVQ

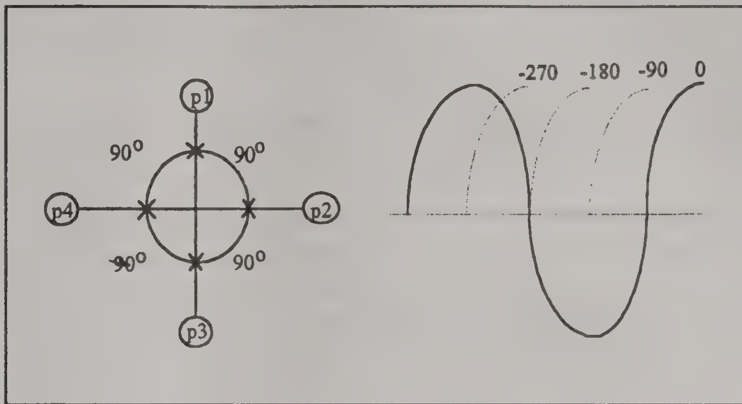
NEW!: INTRODUCTION TO SSTV by Mike Wooding G6IQM	$16.45 post paid	______
> BATC TV Handbook, An Introduction to Amateur Television	$16.95 post paid	______
> BATC Compendium, (Out of print, limited quantities on hand)	$12.50 post paid	______
> ATV Secrets Volume I, For Aspiring ATV'ers. A complete book for beginners and non technical readers. 64 pgs, 100 diagrams,	$11.50 post paid	______
> TV Secrets Volume II, over 40 authors present over 90 televison topics and projects for novice to expert. Over 260 pages!	$27.75 post paid	______
> SPECIAL, Both Vol I and Vol II ATV Secrets	$34.95 post paid	______
> Videos: These can't be shows on TV but many were by accident!		
> Bloopers, gags, out takes, edit room antics, rated hard R 6 tapes	$60/set post paid	______
> International collection of bloopers, gags, out takes, rated X!	$60/set post paid	______
> (Allow for duplication time) Both sets SAVE!!	$99/set post paid	______
> Half hour ATV demo tape, <u>An ATV Balloon Adventure.</u> Edited search for ATV DX as KB9FO snags the elusive 1 watt ATV picture from over 350 miles away. Shows how preamp helps and ATV, HF activity. For club or demos no music!	$6.50 post paid	______
> 8 page <u>ATV IS Fun and Inexpensive</u> activity builder flyers	$5.50 post paid pkg/25	______
> Full color ATV Test chart set, as published in TV Secrets Vol.2	$5.00 post paid	______
> CQ-TV Subscription. BATC quarterly ATV magazine	$21/yr	______
> VHF Communications Subscription, quarterly VHF-UHF magazine	$27/yr	______
	total $	______

SEND TO: ATVQ
1545 Lee St.
Des Plaines, IL 60018
PHONE ORDERS 708 298 2269, FAX ORDERS 708 803 8994
3.5% bank fee added to charge orders.

THE NICAM DIGITAL STEREO TV AUDIO SYSTEM

By Steve Walsh, G8KUW

from SEVERNSIDE newsletter



This is another in a short series of P5 items of interest to the TV Amateur, this time explaining the latest development in commercial TV broadcasting, NICAM.

The acronym stands for Near Instantaneous Companded Audio Modulation. It is intended to supplement the standard FM 6 MHz audio carrier rather than replace it. Mendip has been transmitting NICAM audio for some time now, and I can personally vouch for the high quality.

The NICAM carrier is at 6.552 MHz, slightly higher than the normal subcarrier and it occupies a bandwidth of 700 KHz at a level some 20 db down on the vision carrier. The quality improvement is mainly due to the digital encoding of the audio. Stereo audio is digitised in the studio at a rate almost as high as Compact Disc audio (44 KHz), in fact NICAM is sampled at 32 KHz into a 14 bit instantaneous value of the audio amplitude. Nyquists theorum dictates that the maximum allowed audio frequency is therefore 15 KHz. The 14 bits are companded (compressed) to 10 bits after which a parity bit is added for error checking. The two 11 bit words are DQPSK encoded onto the 6.552 MHz carrier.

Differential Encoded Quadrature Phase Shift Keying (DQPSK) is a very suitable modulation system to use with TV. The noise immunity is better than Teletext event at low signal strengths.

A NICAM receiver will switch automatically between NICAM audio and intercarrier audio should the signal become too distorted to resolve the digital bit stream, or should the NICAM data be missing from the signal, such as when playing a VCR tape.

DQPSK works by shifting the phase of the carrier with respect to an unmodulated carrier of the same frequency and phase. The data stream is divided into bit pairs 00,10,11,01. These correspond to a carrier relative phase shift of 0°, -270°, -180°, -90°. The result is that the data is transmitted at a rate of 728 Kbits/sec. The original name for the system was NICAM 728.

There is no plan at this time to convert GB3ZZ to NICAM! However, some non-NICAM TV sets can be converted to decode NICAM, it depends on the IF filter tailoring. Some SAW filters will attenuate the 6.552 MHz signal too much to be of use, but most IF stages that use inductor tuning are wide enough or can be returned to accommodate the new signal, Maplin are selling a conversion kit.

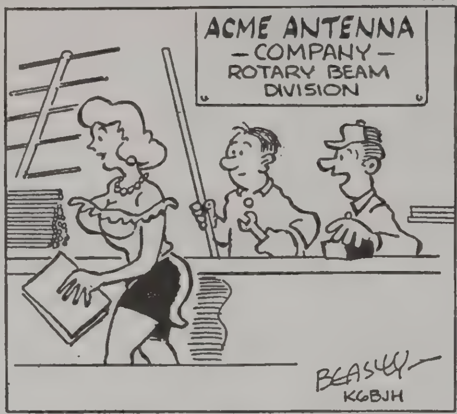
RF TRANSMISSION PATH LOSS AND CARRIER TO NOISE RATIO

By Tom O'Hara, W6ORG

FREQUENCY	434 MHZ
DISTANCE	22 MILES
TRANSMITTER POWER	1.5 WATTS
TRANSMIT ANTENNA GAIN	14 DB
TRANSMIT COAX LINE LOSS	3 DB
FREE SPACE PATH LOSS	116.2 DB
SIGNAL STRENGTH ARRIVING AT RECEIVE SITE	-75.6 DBM 37.2 UV
RECEIVER ANTENNA GAIN	14 DB
RECEIVER COAX LOSS	3 DB
SIGNAL STRENGTH AT RECEIVER INPUT	-66.7 DBM 103.1 UV
MINIMUM RECEIVER SENSITIVITY IS	-106.2 DBM
(SYSTEM NF=3 DB WITH 3000 KHZ BW)	1.1 MICROVOLTS
CARRIER TO NOISE RATIO IN THIS CASE IS	39.5 DB
TRANSMIT ANT HEIGHT 70 FT, RF HORIZON IS	11.8 MILES
RECEIVE ANT HEIGHT 50 FT, RF HORIZON IS	10 MILES

```
1   REM RF TRANSMISSION PATH LOSS & CARRIER TO NOISE RATIO, BY TOM O'HARA, W6ORG
2   REM MODIFIED FOR THE TRS-80 COLOR COMPUTER AND MICRO COLOR COMPUTER, MC-10 BY HARRY SEYFERT, WD9FYF
10  CLS: PRINT "RF TRANSMISSION PATH LOSS AND CARRIER TO NOISE RATIO.":PRINT
100 PRINT:INPUT"ENTER FREQUENCY IN MHZ...";F
110 INPUT"ENTER DISTANCE IN MILES...";D
120 INPUT"ENTER TRANSMITTER OUTPUT POWER IN WATTS...";X
130 INPUT"ENTER TRANSMITTER COAX LOSS IN DB...";L1
140 INPUT"ENTER TRANSMIT ANTENNA GAIN IN DB OVER A DIPOLE...";A1
142 INPUT"ENTER TRANSMIT ANTENNA HEIGHT ABOVE GROUND IN FEET...";H1
150 INPUT"ENTER RECEIVE ANTENNA GAIN IN DB OVER A DIPOLE...";A2
152 INPUT"ENTER RECEIVE ANTENNA HEIGHT ABOVE GROUND IN FEET...";H2
160 INPUT"ENTER RECEIVER COAX LOSS IN DB...";L2
170 INPUT"ENTER PREAMP TRANSISTOR NOISE FIGURE IN DB...";N
180 INPUT"ENTER RECEIVER BANDWIDTH IN HKZ (TV IS 3000)...";B
190 PRINT
200 GOSUB 400
210 GOSUB 500
212 PRINT:PRINT"PRESS ' ' ENTER ' ' TO CONTINUE."
215 IF INKEY$<>CHR$(13) THEN 215
218 CLS
220 PRINT"ENTER DESIRED CHOICE:":PRINT"C FOR CHANGES.":PRINT"N FOR ALL NEW.":PRINT"P FOR PRINTOUT."
225 INPUT C$
230 IF C$="C" THEN GOSUB 700
240 IF C$="P" THEN GOSUB 900
250 IF C$="N" THEN GOTO 10
260 IF ( ( C$<>"C") OR (C$<>"N") OR (C$<>"P") ) THEN GOTO 218
400 L=36.6+20*(LOG(F)/LOG(10) )+20*(LOG(D)/LOG(10) ):REM PA
410 W-30+10*(LOG(X)/LOG(10) ):REM XMTR POWER TO DBM
```

```
420 R1=W+A1-2.15-L1-L:REM DBM AT RCV SITE
430 M1=10^(.05*(107+R1) ):REM DBM TO MICROVOLTS
440 R2=R1+A202.15-L2:REM ADD ANT GAIN LESS COAX LOSS
450 M2=10^(.05*(107+R2) ):REM DBM TO MICROVOLTS
460 S+-174+10*(LOG(B*1000)/LOG(10) ) +N+1:REM -DBM MIN SENSITIVITY
470 S1=10^(.05*(107+S) ):REM -DBM TO MICROVOLTS
480 S2=R2-S
490 H3=1.415*SQR(H1):H4=1.415*SOR(H2):REM RF HORIZON
499 RETURN
500 CLS
510   PRINT"FREQUENCY:";F;"MHZ."
520 PRINT"DISTANCE:";D;"MILES."
530 PRINT"TRANSMITTER POWER;";X;"WATTS."
540 PRINT"TRANSMIT ANTENNA GAIN:";A1;"DB."
550 PRINT"TRANSMIT COAX LINE LOSS:";L1;"DB."
560 PRINT"FREE SPACE PATH LOSS:";INT(L*10+.5)/10;"DB."
570 PRINT"SIGNAL STRENGTH ARRIVING AT RECIEVE SITE:";INT(R1*10+.5)/10;"DBM /";INT(M1*10+.5)/10;"UV."
600 PRINT"RECEIVER ANTENNA GAIN:";A2;"DB."
610 PRINT"RECEIVER COAX LOSS:";L2;"DB."
612 PRINT:PRINT"PRESS ' 'ENTER' ' TO CONTINUE."
614 IF INKEY$<>CHR$(13) THEN 614
616 CLS
620 PRINT"SIGNAL STRENGTH AT RECEIVER":PRINT"INPUT:";INT(R2*10+.5)/10;"DBM / ";INT(M2*10+.5)/10;"UV."
640 PRINT"MINIMUM RECEIVER SENSITIVITY IS ";INT(S*10+.5)/10;"DBM (SYSTEM NF=";N_1;"DB WITH";B;"KHZ
BW);";INT(S1*10+.5)/10;"DB."
660 PRINT"CARRIER TO NOISE RATIO IS";INT(S2*10_.5)/10;" DB."
670 PRINT"TRANSMIT ANT HEIGHT";H1;"FT. :PRINT"RF HORIZO IS";INT(HR*10_.5)/10;"MILES."
680 PRINT"RECEIVE ANT HEIGHT";H2;"FT.":PRINT"RF HORIZON IS";INT(HR*10+.5)/10;"MILES."
690 RETURN
700 CLS:PRINT"SELECT CHANGE:':PRINT"1. FREQUENCY (MHZ). ":PRINT"2. DISTANCE (MI).":PRINT"3. TRANSMITTER POWER
    (W)."
710 PRINT"4. TRANSMITTER COAX LOSS (DB).":PRINT"5.  TRANSMIT ANTENNA GAIN (DB)."
720 PRINT"7. RECEIVE COAX LOSS (DB).":PRINT"8. PREAMP NOISE FIGURE (DB).":PRINT"9. RECEIVER BANDWIDTH (KHZ)."
725 PRINT"10. TRANSMIT ANT. HEIGHT (FT).":PRINT"11. RECEIVE ANT. HEIGHT (FT)."
730 INPUT C:GOSUB 800:INPUT"ENTER NEW VALUE...";V
740 IF C=1 THEN F=V:GOTO 200
741 IF C=2 THEN D=V:GOTO 200
742 IF C=3 THEN X=V:GOTO 200
743 IF C=4 THEN L1=V:GOTO 200
744 IF C=5 THEN A1=V:GOTO 200
745 IF C=6 THEN A2=V:GOTO 200
746 IF C=7 THEN L2=V:GOTO 200
747 IF C=8 THEN N=V:GOTO 200
748 IF C=9 THEN B=V:GOTO 200
749 IF C=10 THEN H1-V:GOTO 200
750 IF C=11 THEN H2=V:GOTO 200
760 IF (C>11) OR (C<1) THEN GOTO 700
800 IF C=1 THEN PRINT"PRESENT VALUE =";F
801 IF C=2 THEN PRINT"PRESENT VALUE =";D
```



I THINK THE BOSS HIRED HER BECAUSE OF HER GREAT FRONT-TO-BACK RATIO

NO RUBBER DUCKS!

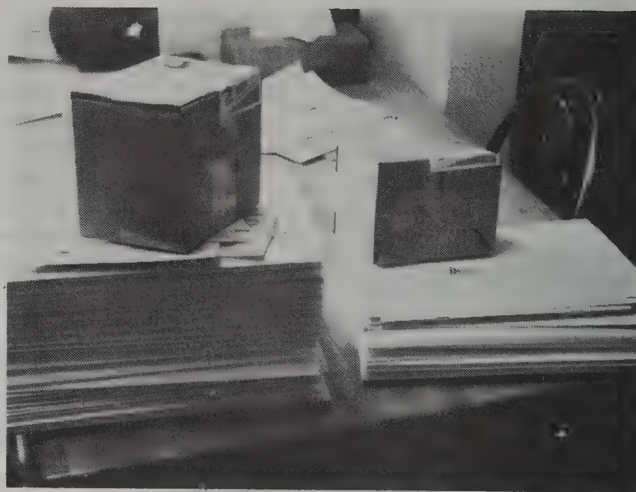
RF PATH LOSS AND C/N RATIO

```
802 IF C=3 THEN PRINT"PRESENT VALUE =";X
803 IF C=4 THEN PRINT"PRESENT VALUE =:"L1
804 IF C=5 THEN PRINT"PRESENT VALUE =";A1
805 IF C=6 THEN PRINT"PRESENT VALUE =";A2
806 IF C=7 THEN PRINT"PRESENT VALUE =";L2
807 IF C=8 THEN PRINT"PRESENT VALUE =";N
808 IF C=9 THEN PRINT"PRESENT VALUE =";B
809 IF C=10 THEN PRINT"PRESENT VALUE ";H1
810 IF C=11 THEN PRINT"PRESENT VALUE =";H2
811 IF (C<1) OR (C>11) THEN PRINT"INVALID ENTRY! PRESS ' 'ENTER' ' "
815 RETURN
900 CLS:PRINT"PLEASE INSURE PRINTER IS READY. ":PRINT:PRINT"PRESS ' 'ENTER' ' WHEN READY."
905 IF INKEY$<>CHR$(13) THEN 905
910 LPRINT"RF TRANSMISSION PATH LOSS AND CARRIER TO NOISE RATIO.  BY TOM O'HARA, W6ORG.":LPRINT
920 LPRINT"FREQUENCY..................................................     ";F;" MHZ"
930 LPRINT"DISTANCE.....................................................     ";D;" MILES"
940 LPRINT"TRANSMITTER POWER.....................................     ";X;" WATTS"
950 LPRINT"TRANSMIT ANTENNA GAIN.............................     ";A1;" DB"
960 LPRINT"TRANSMIT COAX LINE LOSS...........................     ";L1;" DB"
970 LPRINT"FREE SPACE PATH LOSS.................................     ";INT(L*10+.5)/10;" DB"
980 LPRINT"SIGNAL STRENGTH ARRIVING AT RECEIVE SITE.:";INT(R1*10+.5)/10;" DBM";INT(M1*10+.5)/10;"UV"
990 LPRINT"RECEIVER ANTENNA GAIN...............................     ";A2;" DB"
1000  LPRINT"RECEIVER COAX LOSS...................................     ";L2;" DB"
1010  LPRINT"SIGNAL STRENGTH AT RECEIVER INPUT...........";INT(R2*10+.5)/10;"DBM";INT(M2*10+.5)/10;"UV"
1020  LPRINT"MINIMUM RECEIVER SENSITIVITY IS................";INT(S*10+.5)/10;" DBM
1030  LPRINT" (SYSTEM NF=;N+1;"DB WITH";B;"KHZ BW)";TAB(45)INT(S1*10+.5)/10;"MICROVOLTS"
1040  LPRINT"CARRIER TO NOISE RATIO IN THIS CASE IS.....";INT(S2*10+.5)/10;" DB."
1050  LPRINT"TRANSMIT ANT HEIGHT";H2;"FT,"TAB(28)"RF HORIZON IS.....";INT(H3*10+.5)/10;"MILES."
1060  LPRINT"RECEIVE ANT HEIGHT";H2;"FT,"TAB(28)"RF HORIZON IS...";INT(H4*10+.5)/10;"MILES."
1070  CLS:GOTO 220
```

ARE YOU LOST?

From time to time we get orders we cannot fill. We would like to, but somehow, the information is just not there. For instance, we received a phone message asking that we renew a subscription. Wonderful, we love to do things like that. Only problem is, the caller only left his charge card number, no name, no address, no phone.

We got a request from Iuka, MS, for an issue. We love to send these out to fill requests. We spend most of our income at the Post Office and 4 out of 5 checks we write are to the Post Office. Our single biggest expense is postage and shipping! Pictured here is one average day's mailing! Problem is, the package came back marked: attempted, not known.



We received a cashier's check in the August mail. We think it is from Italy. But we can't be sure, because there is only a name and no address for a book and 5 year subscription! We can only wait until the sender writes to complain that they didn't get their order and hope they include their address.

We received an order for video tapes. Again, we have no idea where to ship them!

Then there are the few that get lost in the mail. We receive other people's mail placed in our box in error, so it is likely that some mail meant for ATVQ is winding up in someone else's box. We even had some mail that was sent by the Seattle Post Office to another magazine, which fortunately sent it back to us. One recently was sent to AEA, because their ad is on the back cover and the Post Office apparently couldn't read or didn't read the ATVQ address on the index page, where the Post Office demands it to be!

Other publications tell us they have the same problems.

The last is people who move and don't bother to send us a notice, then complain they didn't get their issue. The Post Office will NOT forward any 3rd or 4th class mail unless you tell them you will pay the postage. Even if you move from apartment A to apartment B in the same building (no kidding) the Post Office rips the magazine to shreds, sends us back a postage due envelope with the address label and a stick on yellow address change. We send these back to the person with a replacement issue, which means they get their issue 6-10 weeks later than it they had notified us they moved. No kidding! The Post office sent us back an issue because the person moved across the hall in the same apartment building and marked it "moved, unable to deliver."

Do any of these people sound like you?

If you tried to renew, or placed an order you didn't receive, get in touch with us. We want you to have what you ordered, but the Post Office won't deliver it to you if there is no address on the envelope or package!

We fill most orders in a few days. Video tapes take a couple of weeks to dub off. Volume II of ATV Secrets has taken longer than expected but is now available. Anyone who has not received their copy should contact us now.

I work for a living at a full time job, as director of Engineering at a Chicago TV station, which often is a 7 day a week job. The station is very active in outside broadcasts (remotes). For example, two live parades and a 2 day live concert in September and four children's programs from a museum to be video taped. Plus union contract negotiations and the usual stuff like keeping track of the tower painting. I also travel and go on vacation. We usually note these absences on the answering machine. At most I am out of town for three weeks at a time.

So if you haven't got what you asked for, maybe it's because we couldn't send it, or we didn't get the order. Let us know. We want you to have what ever you wanted. Its why we are in business!

FSTV REPORT
Fred, K3TAZ

September 3rd was the "Freshman Orientation" at Westminster High School. The ham radio demonstration was really quite impressive. Joe, WY3Y, had three displays running simultaneously with a strobe light and revolving red warning light to attract attention. A video tape was running continuously showing the "Wide World of Amateur Radio". The tape featured Roy Neil, Barry Goldwater and several other well known amateur radio operators. The video does a nice job of showing all the aspects of amateur radio. There was a second monitor setup that was live FSATV from Dotty, N3HDG. Dotty spoke with some of the Freshmen. She also demonstrated how our dog, Brandy, can do tricks for the camera. Greg, WA2WYK, provided the software for a continuous running display of satellite pictures showing hurricane Andrew. This display got considerable attention from people who came past. An example of 2 meter operation was also available to those who were interested. There were seven freshman who signed up to show their interest in the high school radio club. Our thanks to everyone who helped to make the "Freshman Orientation" a success.

K3PZN FREQUENCIES

Repeaters:		
2 meters	145.410 -	Auto patch
70 cm	449.875 -	Linked
Simplex:		
2 meters	146.475	
BBS:		
145.030	user input	
446.075	forwarding port	
Nets:		
Tuesday	2030 145.41 ARES/RACES	
	N3CWG, Doug NC	
Thursday	2000 145.41 Crazy 8	
	N3LTM, Kim NC	
Saturday	2000 28.115 RTTY	
	N3GFZ, Harold NC	

By the time that you read this column there hopefully will have been one ultralight flight, if not more. I have included a schematic of the 555 timer in use with the system. The 555 timer is such a versatile device I thought that some of the club members may be interested in using it for a ham shack project.

There should be good weather for flying. So let's investigate how you might be able to see signals from KE3AR, John's aircraft. The easiest and most cost effective method is to use your cable ready television or VCR. The key words here are "Cable Ready". This means that the tuner has at least three modes of operation. The normal mode of operation for the tuner is to receive off the air signals. Broadcast TV is not setup in one continuous band of frequencies. The first set of TV frequencies starts with channel 2 at 54 Mhz and ends with channel 6 at 88 Mhz. There is a break of about 4 Mhz between TV channels 4 and 5. The break between channel 6 and 7 is 86 Mhz wide. In between those two channels is the entire FM broadcast band, the AM aircraft band and the FM VHF high band. From channel 7 to channel 13 is a continuous stretch of 32 Mhz. The UHF television band is unusual in that it is a continuous band of frequencies starting at 470 Mhz and is 414 Mhz wide. The top frequency for the UHF TV band is 884 Mhz. This has all been setup by the FCC for the over the air TV broadcasters. However, cable television does not have to live by these rules because they do not broadcast as we normally think of the term. The signal for cable television is kept entirely within the cable (theoretically). Since the cable operator is not interfering with the over the air broadcasters, he can put his channels all in sequence and not have to worry about any interference problems. So the cable operator has channels that go continuously through the FM broadcast band, the 2 meter, 220 & 450 ham bands and right through many other broadcast services. This is possible because there is no signal allowed to leak from the cable. There are three band plans for cable television, the normal system (cable passes the same broadcast frequency through), the HRC system (Harmonically Related Carrier) and IRC system (Incremental Related Carrier). The normal system means that the cable frequencies match the frequency of the broadcaster. In the HRC system the cable channel frequencies are offset from normal broadcast frequencies by a fixed amount except for channels 2, 3 and 4. The IRC system has an offset on all channels input to the system. CATV channel designations have not been standardized so you may find this differs from what you are used to. The ATV transmitter that will be in John's ultralight will be on 439.25 Mhz. In the IRC plan this comes out to channel 60 exactly. So, in order to receive John when he is within several miles of your home, put your TV or VCR in the CATV mode of operation.

The front panel of the VCR indicates which CATV mode it is operating in. Check the manual for your TV or VCR to be sure how to operate your particular piece of equipment. Once the receiver is tuned to the IRC mode select channel 60. This will put you right on 439.25 Mhz. We are using a horizontally polarized omni-directional antenna. This will be compatible with your outside TV antenna. If you are only using cable TV and have no outside antenna, then even a simple dipole made with 300 ohm line will work. This will give a signal when John is close in to your home QTH. Place your dipole outside and at least 5 or 10 feet off the ground. Your deck is a good place to start. Our simple coordination frequency is the club simple channel 146.475 Mhz.

It is interesting to note that HRC and IRC channel 18 are both right in the middle of the 2 meter band. The HRC channel 18 starts at 144.00 Mhz and ends at 150 Mhz. The television signal takes up 6 Mhz of spectrum space. The carrier frequency of HRC cable channel 18 is 145.25 Mhz. Any leakage from the cable could be heard in the two meter band. If you notice A strange growling noise while driving along and monitoring the clubs 2 meter repeater that could be some RF leakage from the cable. The clubs 450 repeater falls in the range of cable channel 61 and 62. Good luck with your FSATV reception.

COASTAL AMATEUR RADIO SOCIETY REPEATER NOW ON LINE

By Philip A. Neidlinger, KA4KOE

Appreciable ATV activity began in the Savannah, Georgia area approximately two years ago. As is often the case a few dedicated enthusiasts maintain a steady, but limited level of activity. Few people, at least in this city, were willing to make the investment towards a high power simplex ATV station of their own. We began to realize that a repeater would probably be the only way to attract newcomers into this specialized, yet very special part of amateur radio.

Several attempts by individual hams were made to put up an effective ATV repeater, but it became clear that only through the efforts and resources of a large and established radio club would a usable, easily accessible repeater be erected. Club president Jim Poore, KD4WF, spearheaded the project, and with the aid of generous donations, sweat, and considerable time spent, the KK4TO amateur television repeater went on-line 11 August 1992 on the frequency pair of 434.00 MHz input/421.25 MHz output.

The KK4TO ATV repeater is located at the WSAV TV channel 3 transmitter site in western Chatham county, near the intersection of interstate highways 95 and 16. The machine is configured in a rather unique manner that saved the club considerable expense by utilizing existing facilities and equipment: see Figure 1. The feed lines for both C.A.R.S. 2 meter repeater are operated double-duty through the use of RX/TX crossband couplers at each antenna and the ATV receiver/transmitter. Necessary remote functions are provided by Advanced Computer Concepts ACC-850 and ACC-85 controllers originally installed for the 2 meter repeaters on-site. ATV repeater functions can be accessed through telephone links or secondary DTMF control codes sent on either 2 meter repeater.

The repeater antennas are commercial grade Sinclair 4-bay folded dipole arrays rated at approximately 5.5 dB gain each. These antennas are mounted opposite their respective 2 meter antenna on the tower. PC Electronics standard Hammond box enclosed receiver/transmitter modules comprise the heart of the system. FCC requirements for identification are met by an Elktronics VDG-1 board.

Excellent coverage of both Chatham and Effingham counties has been realized through the use of a HI-Spec model 70BA250 vacuum tube power amplifier. Output power (sync tip) averages approximately 130 watts. Although the repeater antennas are vertically polarized, some ATVers have reported P3-P4 signals on horizontally polarized 15 dB K1FO beams @45' over a 15 mile path. With a -20 dB gain penalty for wrong polarization, the reception reports are outstanding when one considers that the "flatside" boys have effective signal gains of -5 dB. Wow!

Since the ACC-850/ACC-85 controllers have numerous peripheral control ports, it will be quite easy to add features as needed. Future projects will include access to National Weather Service radar feeds in emergencies and remote video link sites situated at high points in Savannah (all transmitting on 434 MHz). These remote video feeds could also be activated by DTMF access tones.

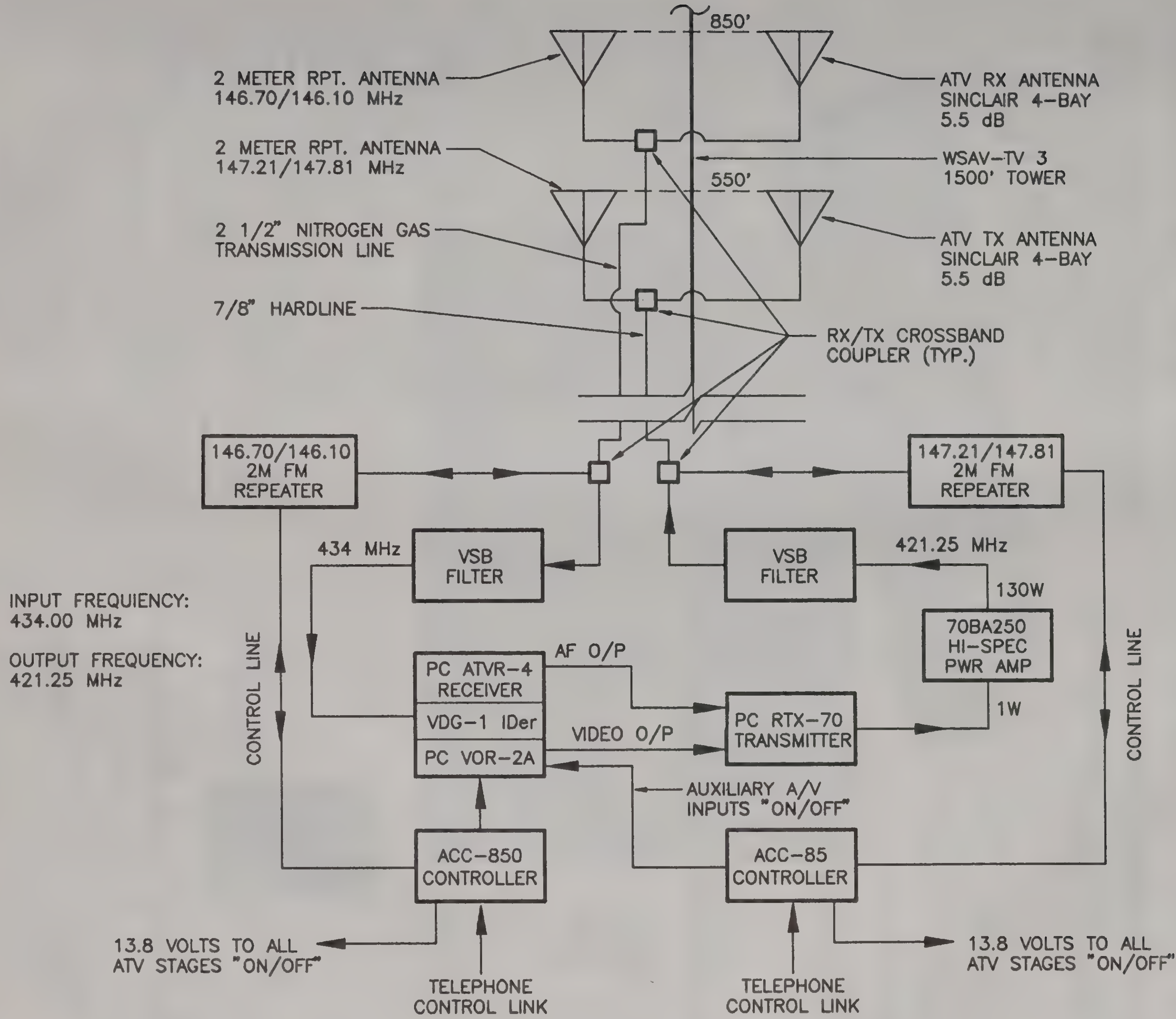
Long range plans hopefully will enable us to link with existing ATV repeaters in Charleston, S.C. (100 miles distant) and St. Simons Island, Georgia (90 miles distant). Although we are a <u>long</u> way from approaching anything the big boys in California are doing in ATV, we are making progress. 73 guys!Philip A. Neidlinger, KA4KOE, 3331 Louis Street, Thunderbolt, Georgia 31404, (912) 354-5043 evenings for information

EMERGENCY COMMUNICATION AND ATV

Every county in Montana has a County Disaster Emergency Services Coordinator, and it may be well worth your time to talk to this person and explain how operation of ATV could help.

Among services that we could provide are: a means of transmitting weather radar from the weather bureau and show weather patterns directly to Emergency Operation Center (EOC) and the ability to show live coverage of disaster areas to EOC.

The coordinators are allotted money which may be used for the purchase of radio equipment and could help support an ATV system or repeater in your area. Some counties have vans, buses or other areas set aside as communications centers. They would welcome the new technology, and your assistance. If you are not sure who your DES coordinator is, call your local county court house.



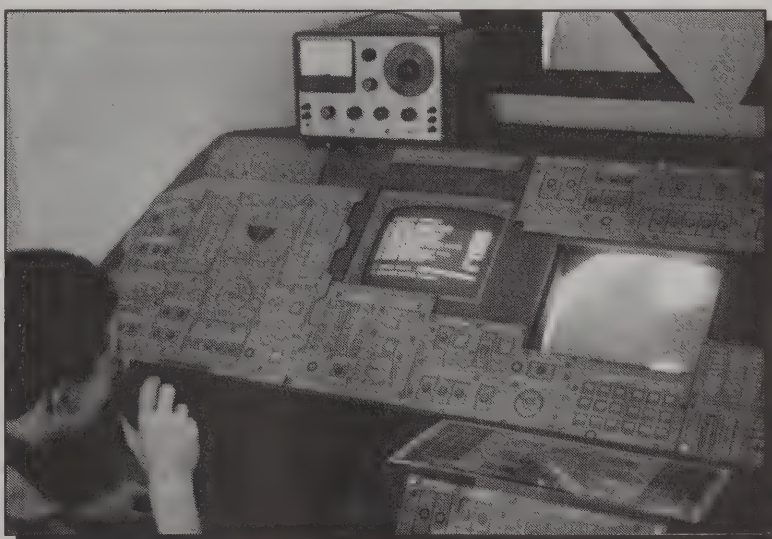
KK4TO ATV REPEATER BLOCK DIAGRAM

P.NEIDLINGER
22 AUG 92

DREAM FLIGHT
WAUSAU ATV OPERATIONS OVERVIEW

Dean Andrewjeski, AD9W

Several months ago in the Winter 1992 issue of ATV2 Volume 5 #1 you asked the question "Are You In Orbit?". At that time I was quite involved with an ATV project involving the Wausau School District Area ("Dream Flight Wausau") and didn't have the time to write back about it from here. I'm finally getting around to give you the article that I wrote about this experience. This article was written for 2SI and parts of which are to be published in the October 1992 issue. I haven't seen the edited version yet but enclosed is the original complete with diagrams.



The primary role of amateur television in the "Dream Flight Wausau" project was to provide video and audio feeds from the Shuttle Bus "Apollo Condor" into six grade classrooms. There are thirteen elementary schools in the Wausau school district. The idea was to provide amateur television coverage of each day's activities in and around the Shuttle bus as it traveled space and time to each school, which were known as planets. Since there would be time needed by the camera crew for set up and take down activities at each "planet", additional video "fill" coverage would be needed during those times. This was accomplished by setting up a small TV studio at the Riverview school known as mission control. Video originated from mission control beginning and ending each day, and Mission control video at times included a live camera source with character display, at other times a global display of the MIR space station via the AMSAT's InstantTrack program and at other times video floppy still store images or a computer generated character text and picture display. The Riverview school mission control TV aspects were modeled after the real NASA mission control space shuttle TV coverage as seen on NASA Select television.

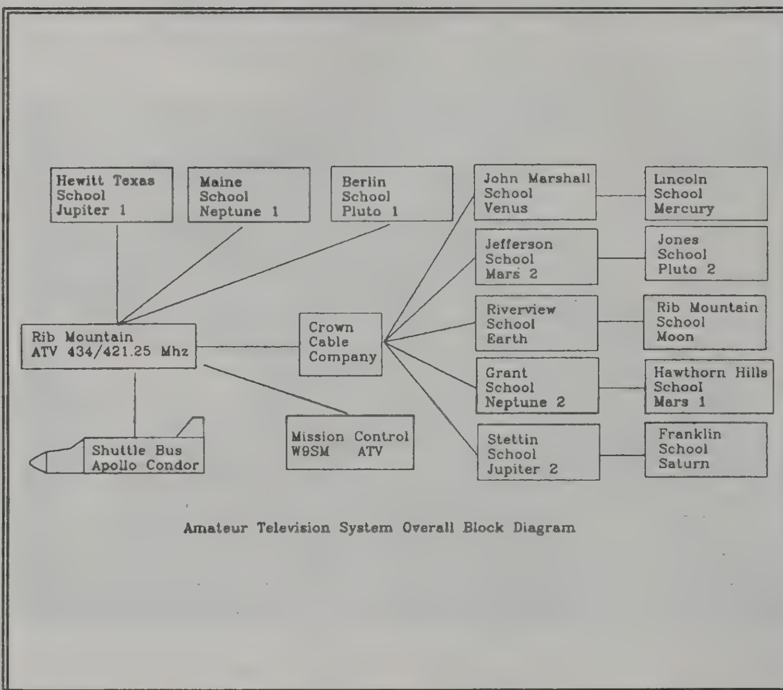
Personnel requirements for these TV tasks were accomplished by only four radio amateurs during the actual mission. Amateur television transmissions began at 8:00 a.m. and ended at 4:00 p.m. each day during the layout and operation of the shuttle camera "uplink" aspects of this project. He and an assistant, either Mat Bauman, N9NMH, or Jack Klein, N9LIA, provided the video and audio coverage from the shuttle bus each day. Dean Andrewjeski, AD9W, worked mainly at the mission control facilities each day, coordinating and switching video sources between the mission control facilities and the space shuttle.

A variety of video equipment was required for this project. Besides the usual ATV transceiver and antenna/coax items necessary to transmit video signals, an array of video test, generating monitoring and adjustment equipment was needed. A means had to be provided to up-link video from ground level in town locations to all schools. The amateur television up-link signals had to clear Twelve volts dc and 120 vac power requirements were needed to operate the video equipment from the shuttle bus locations independent of commercial sources.

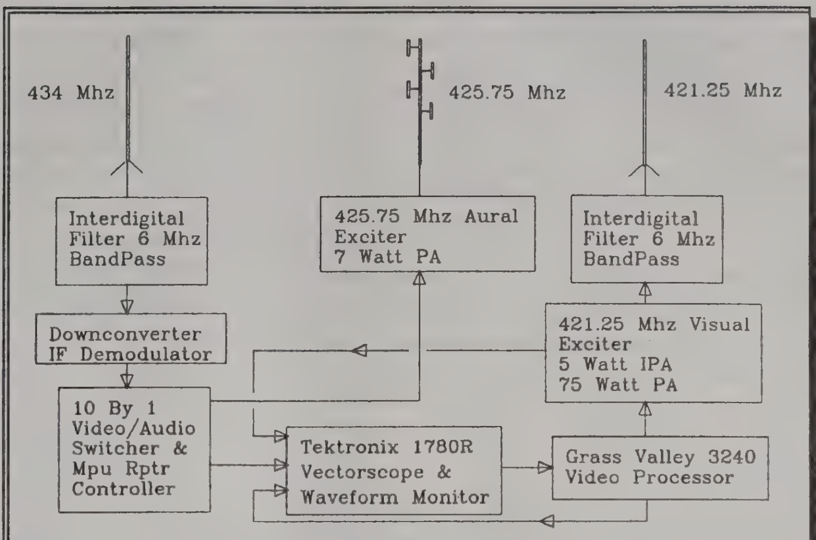
Technical Aspects

At first the idea was a simple one. The idea was to send and receive video from the shuttle bus to mission control and vice versa as the shuttle traveled throughout the school district. A portable ATV repeater was proposed to accomplish this task. A friend of mine suggested sending video to all schools simultaneously, so all the six grade kids could see what was happening in real time. I thought that was an excellent idea but knew the club only had six AEA VSB-70 ATV transceivers on loan to use for this project with only three of the AEA ATV beam antennas. By this time I had proposed the use of the existing Rib Mountain Amateur Television Systems (RMATS) instead of the portable ATV system. Fred Prehn, WX9W, asked me to join in on the project and I volunteered to do so.

There were several technical problems to be resolved in order for amateur television to work on this project. The ATV repeater system currently was set up to receive the lower vestigial sideband of 439.25 Mhz as the repeater input. The output of the repeater was 421.25 Mhz (upper vestigial sideband). The AEA ATV rigs are designed to transmit only the upper vestigial sideband and would not work in to the ATV system unless a solution could be found. The solution to this problem was to reconfigure the repeater input for 434 Mhz upper vestigial sideband. The ATV repeater input interdigital filter was returned with the aid of a Tektronix 2712 spectrum analyzer with tracking generator option. Since the filter already was tuned for the lower vestigial sideband of 439.25 Mhz, it easily tuned down the additional 2 Mhz to receive a 434 Mhz ATV signal. (The reason that the lower vestigial sideband of 439.25 Mhz had been previously used as the repeater input was due to the problem of numerous spurious signals falling into the video passband of 439.25 to 443.75 Mhz range.) Since a major rework of the ATV repeater input system was in progress, we decided it was time to make improvements on the receiver antenna system. A high gain vertical polarized Diamond (F-718J 430-440 Mhz version) antenna was purchased to replace an older 3 db gain vertical antenna at a lower elevation. This new antenna was attached to the 125 foot level on the main broadcast tower on Rib Mountain. (Several months ago the transmit antenna was replaced with a similar Diamond high gain vertical. This antenna covered the 420-430 Mhz portion of the 70 cm band.) Immediately after replacing the antenna, improved ATV receiver coverage was noted. Two of the most difficult planned shuttle bus locations to receive from were now producing P5 pictures.



Amateur Television System Overall Block Diagram



Simplified 70cm ATV Repeater Block Diagram

The next problem was how to link thirteen schools for amateur television with only six available ATV transceivers! Well how about cable television! A call was placed to the local cable company, Crown Cable Company, in Wausau, WI. In a week their secretaries had comprised a listing of schools that had cable service hookups. From this list, ten out of the thirteen schools had cable service hookups. The three remaining schools were out of the wired Crown cable service area and would need an ATV receiver/antenna system to receive the ATV signals directly from the Rib Mountain ATV repeater system. Another call was placed to the cable company to explain what we wanted to do on the cable company's community access channel (Ch-29). At this time Bruce Wasleske, WB9YVT, Crown Cable Company area engineering manager, was on hand to take care of receiving the ATV repeater output signal and converting it to cable channel 29. The ATV repeater signal was received at the Crown Cable "head end" tower site located approximately 8 miles away from Rib Mountain. A Cushcraft 440 10 element yagi antenna supplied by Rick Maier, KC9NW, was mounted at the 100 foot level on the cable tower by Crown cable technicians. The 421.25 ATV signal was received and downconverted to an intermediate frequency of channel three using a Scientific Atlanta receiver. Next this signal was fed into a Scientific Atlanta channel three signal processor unit that resulted in output IF signals of 45.75 Mhz visual and 41.25 Mhz aural. These IF signals were later switched into a mixer to be upconverted to the channel 29 frequency position for transmission on the cable system. Except for supplying the 440 yagi antenna, all hardware and installation for the cable system "head end" was supplied by Crown Cable Company and their technical personnel.

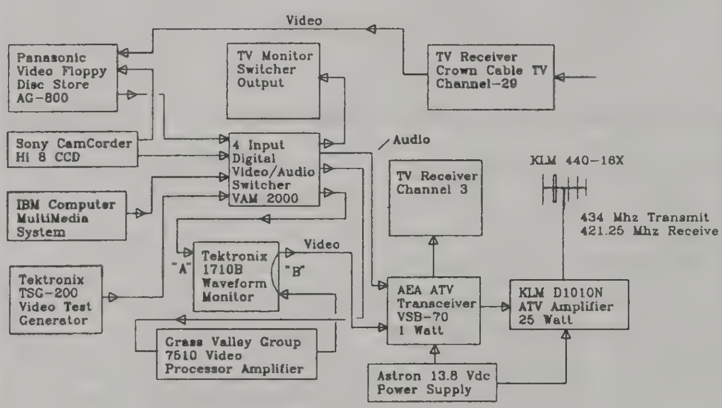
To secure program time on the community access channel, a phone call and follow up letter request was submitted to Barbara Cummings, program coordinator for this service. Normal program origination comes from Northcentral Technical College (NTC) on the community access channel. The time block from 0800 hrs. until 1600 hours was desired for the "Dream Flight Wausau" project. In approximately two weeks our request was granted. All other program sources agreed to relinquish their time spot for this community project. A time clock arrangement was used by Crown Cable Company at the "head end" to switch IF signals between NTC or the ATV repeater each day during the six day mission.

Since no video processing was done by Crown Cable Company, a Grass Valley Group (GVG) model 3240 NTSC video processor amplifier was used in the ATV repeater system to process "Clean Up" the repeated ATV video signals. A video processor regenerates components of a video signal. Here, the 3240 system regenerated horizontal sync, color burst phase and level. It provided adjustable video set up level; luminance and chromanance levels and peak white clipping to prevent over modulation of the visual transmitter. Lastly, a GVG 3220 Linearity Corrector circuit board was added to this system to minimize differential gain and phase caused by "HAM" grade linear amplifiers that were used to amplify the repeater output signal to a 75 watts peak sync power level.

To look at the incoming, processed and ATV repeater outgoing video signals, a Tektronix 1780R combination waveform/vectorscope monitor scope was installed in the ATV repeater rack system. This scope provided simultaneous waveform and vector display used during the initial setup and quality control adjustments throughout the "Dream Flight Wausau" project.

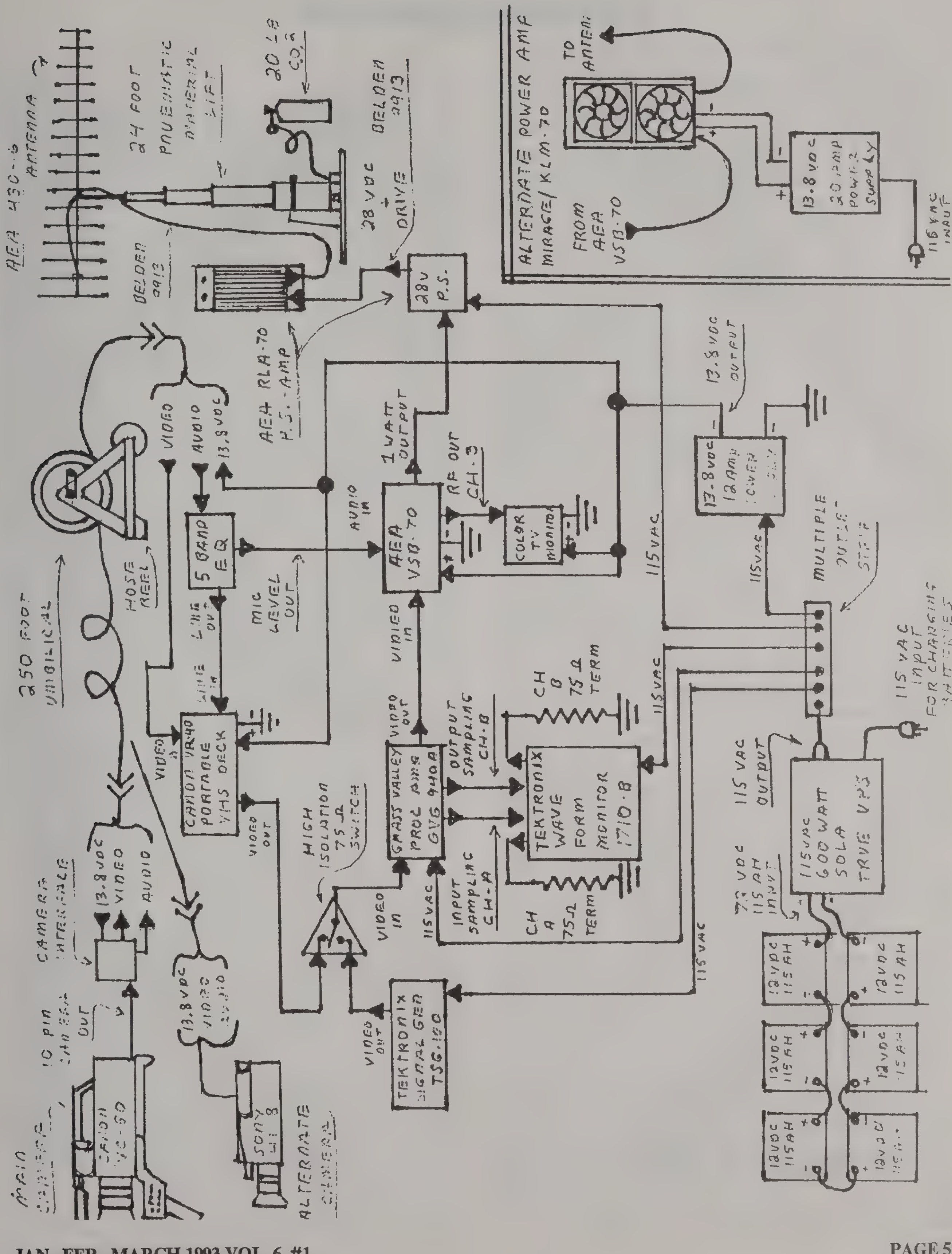
Mission Control ATV

At Riverview School (mission control) the W9SM ATV master control facilities were setup in one corner of the room. To switch between the various video sources used at mission control a four input digital video switcher was employed. The digital mode of this unit allowed non-genlock video sources to be switched in and out without vertical rollover problems. The digital mode also provided some funny moments with live camera shots by providing a variable rate animated "slow scan" images transmissions by the mission control communicators. One of the three outputs from the digital switcher feed directly to a 25" NEC receiver/monitor. Another output was connected to the "A" input of a Tektronix B waveform monitor used to monitor the video switcher output levels. The last output was fed into a Grass Valley Group video processor unit. This unit, a model 7510, is a smaller simpler video processor system again used to regenerate components of the video signal and provide automatic control of the video luminance levels. The output of the video processor was looped through the "B" input of the Tektronix B waveform scope and connected to the AEA VSB-70 1 watt ATV transceiver. Another 19" TV receiver was connected to the channel three output of the VSB-70 ATV transceiver. This arrangement provided local monitoring at the 1 watt transmit level on 434 Mhz and ATV repeater output monitoring on 421.25 Mhz. A KLM ATV amplifier was used to amplify the 1 watt signal to the 25 watts range. Approximately 100 feet of Belden 9913 coax cable was used with Amphenol type N connectors to connect the 25 watts signal to the KLM ATV 440 beam antenna. With this setup and the line of sight distance between mission control and the ATV repeater on Rib Mountain only six miles, the video came in as a P5 plus picture into the ATV repeater system.



Mission Control W9SM ATV Block Diagram

As previously mentioned, three sources of video were used by mission control. Live action camera shots were provided by a SONY cam/corder model CCD-V99. It's a Hi8 solid state pickup camera with 400 lines of resolution and provided excellent video images of the mission control facilities and astronaut communicators. Bob Greenheck, KB9ACQ, provided this camera to mission control for the six day mission. At various times the camera shots consisted of the astronaut communicators using the voice and packet stations. At other moments the HF station operators and positions were televised particularly when contacts to other schools were made by the six grade students/astronauts. Other camera shots focused on the AMSAT InstantTrack satellite tracking program tracking the MIR space station. This arrangement used one of the school district's IBM PS/2 computers running the AMSAT's satellite tracking program.



AEA 430-6 ANTENNA
24 FOOT PNUEMATIC MATERIAL LIFT
20 LB CO2
BELDEN 9913
28 VDC + DRIVE
28V P.S.
AEA RLA-70 P.S.-AMP
ALTERNATE POWER AMP MIRAGE/KLM-70
TO ANTENNA
FROM AEA VSB-70
13.8 VDC 20 AMP POWER SUPPLY
115 VAC INPUT
250 FOOT UMBILICAL
HOSE REEL
VIDEO
AUDIO
13.8 VDC
5 BAND EQ
LINE OUT
LINE IN
MIC LEVEL OUT
AUDIO IN
AEA VSB-70
1 WATT OUTPUT
RF OUT CH-3
COLOR TV MONITOR
13.8 VDC OUTPUT
13.8 VDC 12 AMP
115 VAC
MULTIPLE OUTLET STRIP
CANON VR-40 PORTABLE VHS DECK
VIDEO IN
VIDEO OUT
GRASS VALLEY PROC AMP GVG 940A
OUTPUT SAMPLING CH-B
INPUT SAMPLING CH-A
TEKTRONIX WAVE FORM MONITOR 1710-B
CH B 75 Ω TERM
CH A 75 Ω TERM
HIGH ISOLATION 75 Ω SWITCH
TEKTRONIX SIGNAL GEN TSG-100
115 VAC OUTPUT
115 VAC 600 WATT SOLA TRUE UPS
115 VAC INPUT FOR CHARGING BATTERIES
72 VDC 115 AH INPUT
12 VDC 115 AH
MAIN CAMERA
CANON VC-30
10 PIN CANON OUT
CAMERA INTERFACE
13.8 VDC
VIDEO
AUDIO
ALTERNATE CAMERA
SONY HI 8

The computer's VGA video output ran through a single cable to a Sharp QA-1000 color TFT computer projection panel. The projection panel laid on top of a high light output 3M overhead projector used to project the color display onto the "silver screen". With the room overhead lights dimmed, a high quality color world map display could be seen with the location of the MIR station by the camera's eye and televised for all to see.

Another source of video "fill" was provided by the school district's IBM PS Model 80 computer. A Tecmar's video adaptor board was installed in this computer with the OS2 operating system and IBM's audio visual connection (AVC) presentation management system software package. This hardware and software combination will allow high resolution full color video images to be digitized and stored in the IBM computer. Once images are stored, the pictures can be altered and adjusted to suit the individual user needs. An animated story was set up to show various color school images overlaid a few seconds later with the name of the school (planet) and followed by a character text display using several built in special effects display options. Our objective was to display an image of each school with a text character display of daily activities. Each day a different part of the story was told displaying the schools (planets) involved and scheduled activities. Gary Mueller, an advisory multi-media specialist with IBM, spent an entire day with us to setup this system. The system was setup to run by using a mouse and Icon display menu. I only needed to click on the correct "DAY" Icon to run the software.

The last video source used was a Panasonic Model AG 800 video floppy disc recorder and playback system. This unit can store up to 50 pictures on a tiny 2 by 2 inch floppy disk. It provided a simple means to grab video images from the SONY camcorder or from the video output jack of the cable TV set monitoring the community access channel-29. These images were later televised as an "instant replay" of past activities.

Beginning each day and sometimes ending the day activities, color bars with the W9SM ID character display was aired from mission control. A Tektronix TSG200 portable video test generator and character generator unit provided this display. By viewing the cable channel we could see if the system was working properly and if any adjustments were needed.

Shuttle Cam ATV

The most difficult aspect of this project would be in obtaining high quality pictures from each of the daily shuttle bus school/planet locations. It would make this project truly a dream flight or a nightmare. Some school locations were visual line of sight paths to the Rib Mountain ATV repeater receiver antenna and others were not. Some locations had tall buildings or trees blocking the visual path. So the key to getting the up-link video signals to work properly would be in obtaining a high transmit antenna elevation. Up until the very first weeks before "launch" we discussed the possibility of moving 440 yagi beam antennas, tripods, sand bags and Belden 9913 100 foot cables between school roof tops as a last ditch effort. This procedure fortunately was never used or needed. The solution to the transmit antenna elevation problem was solved by using "Genie", a pneumatic material lift. This lift was found and borrowed from a local refrigeration service and installation company (Horak Refrigeration Co.). This lift is capable of lifting 500 lb. loads up to 25 feet high by using CO2 or compressed air. Mike, N9IAB, obtained and modified the lift to suit his needs. The top wood plate was removed along with the four bottom square tubes with caster wheels used as the base assembly. We didn't need to move the base around once in the final location. Also, the wheels base proved to be unstable with a large 440 antenna up at 25 feet! Using a sketch provided by N9IAB, Randy Oldenberg, N9IYN, of Central Fabricators, fabricated a solid steel plate base replacement unit. With this new base unit, Mike or his assistant simply put the steel base on the ground and drove the rear pickup truck tire on it. With one additional U bolt/wing nut combination the main pneumatic cylinder was locked in place, ready for the beam antenna and raised to the height required. This arrangement gave the shuttle camera crew a maximum of five minutes each for setup and tear down. The actual camera to ATV transmitter hookup used a hardwired arrangement rather than a mini wireless system. Mike, N9IAB, made up a 250 foot umbilical cable system to provide video, audio and dc power from and to the camera. Three conductor SJO type cable provided the twelve dc power used for video. Audio from the camera used a shielded three conductor cable. The high impedance output from the

camera was converted to a low impedance balanced line arrangement by using an audio transformer. At the ATV transmitter end of this cable, the low impedance balanced line was converted back to an unbalanced source. The cable was stored on a garden water hose reel. The cable was unreeled from the hose reel at each location and laid out neatly on the ground. Connections were made and afterward the connections were disconnected and the cable was reeled back onto the garden hose reel. This cable system allowed Mike to walk into the Shuttle bus areas, around the shuttle bus, as well as school classrooms.

The audio from the camera cable connected into a five band equalizer before connecting to the AEA ATV transceiver. On the video side a high isolation switch was used to switch between camera and color bars sources. Color bars were used for equipment and location setup and checkout purposes. The camera video output was connected to a Cannon VHS tape deck and then into a GVG 940A video processing amplifier. Again the components of the video signal were regenerated before transmission to the ATV repeater. Another Tektronix B waveform monitor was used to check before and after processing. A small color 3.5 inch Panasonic TV receiver was connected to the AEA transceiver output (Channel-3) for transmit monitoring and viewing the ATV repeater output signal. The later function assisted in aligning the portable 440 beam at each new location. The 1 watt AEA ATV transceiver output was amplified to fifty watts by its companion RLA-70 amplifier system.

Power was supplied for this setup by a 600 watt Sola uninterruptable power supply (UPS). The Sola UPS converted 72 volts dc from a bank of six, twelve volt deep cycle lead acid batteries to 115 vac. A DC power supply was used where required 13.8 vdc was needed. There was enough capacity in this system to run the ATV uplink for more than six hours continuously.

Voice coordination of activities for amateur television shuttle camera operation and mission control were carried on two meters using the Rib Mountain Repeater Association 146.22/82 system.

Summary

The amateur television aspects for the "Dream Flight Wausau" project took over 100 hours on my part in the planning, testing and actual running of this event. There were additional hours spent by Mike, N9IAB, for setting up his personal pickup truck for uplinking ATV from the shuttle bus.

The first day Murphy's laws were put to the test with unexpected ATV shuttle cam uplink amplifier failure and poor aural signals between the ATV repeater site and the Crown Cable tower receiver site. Although the Video signal from the repeater transmitter was being received adequately at the Crown Cable tower site (1,000 microvolts), the aural signal was facing up and down 20 db in comparison to the visual carrier. The signal fades were caused by blowing tree leaves. That evening the aural repeater transmit antenna (Cushcraft 4 bay dipole array) was raised an additional 25 feet. Dave Kerl, N9BXA, donated 50 feet of 1/2 inch heliax cable toward this evening project. The second day and on the aural signals were received ok and "rock solid" at 12 db below the visual carrier.

On the first day of the mission the AEA RLA-70 50 watt amplifier failed unexpectedly. It had been performing flawlessly over the past several weeks during the school/plant location testing and checkout stages. Mike Schoenfuss, N9GHZ, came to the rescue with the loan of his KLM-70 ATV amplifier that morning. The shuttle bus camera up-link system was back in operation within one hour. Two 12 vdc fans were attached to the KLM-70 amp to keep it cool.

I would like to extend a thank you to the many fine companies and individuals for their generous contribution of television equipment or time for this event. The donated loaned equipment value totaled more than $30,000. These companies include: Tektronix Inc.; Grass Valley Group; Crown Cable; Blonder Tongue Labs; Camera Corner and WHRM-TV (State of Wisconsin). Additional equipment was supplied by International Business Machines (IBM); Horak Refrigeration Co. and Central Fabricators. Without their equipment or time this event would have been more difficult to undertake and less successful.

DREAM FLIGHT ATV

As the saying goes, "A picture is worth a thousand words.". Amateur television played a unique and important role in this project. For many non-hams and some amateur radio operators, this was their first exposure to amateur television. Many interested parents, teachers, students, and the media were amazed at the communications' technology put to work for this event. This event was fun for both the young kids and also us old kids. It sparked the imagination of the very young as well as the old. That was one of the purposes behind this event.

Dream Flight Wausau
Mobile ATV Equipment List

1 1992 Ford F-150 4 x 5 pickup
2 Weather tight portable video/repeater cart.
3 Sola 600 watt 115 vac true UPS (computer grade)
4 6, 12 VDC 115 amp/hr deep cycle batteries (72 VDC bus)
5 13.8 VDC 12 amp power supply
6 13.8 VDC 20 amp power supply (Astron)
7 6 outlet power strip
8 AEA VSB-70 1 watt ATV transceiver
9 AEA RLA-70 50 watt remote amp/power supply
10 Mirage/KLM 70 watt amp
11 AEA 430-16 16 element antenna
12 Tektronix 1710 B wave form monitor
13 Tektronix TSG 100 signal generator
14 Grass Valley Group GVG 940 A video processing amp
15 Canon VR-40 portable VHS tape deck
16 Canon VC-50 color camera
17 Sony Hi-8 camcorder
18 3.5" Panasonic color TV/video monitor
19 Radio Shack mono 5 band equalizer
20 Genie 24' pneumatic material lift
- 20 lb CO 2 cylinder, regulator, valves & hoses
- custom built base plate mount

21 Camera interface
- modified 10 pin camera power supply
- RCA jacks replaced with BNC connectors
- 115 vac line cord removed (connectorized)
- Male 3 pin xlr added for 13.8 VDC input

22 Modified hose cart (water parts left off)
23 250 foot camera umbilical
- 250' Belden 9100 75 OHM coax
- 250' 1 pair shielded audio cable
- 250' 14/3 SJO type power cable

24 Unbalance Hi Z to balanced Lo Z audio balun
25 Balanced Lo Z to unbalanced Lo Z audio balun
26 Hi isolation 75 OHM coaxial switch
27 6 days vacation from work

Finalized Television Equipment Vendor List

Company	Item	Model
Tektronix, Inc.	Waveform Monitor	1780R
	Waveform Monitor	B
	Video Signal Gen.	TSG200
State of Wisconsin	Waveform Monitor	1710B
(WHRM-TV)	Video Signal Gen.	TSG100
	Video Processor	GVG 940
	Video Processor	GVG 3240
Blonder Tongue	TV Modulator	SAVM-60
Grass Valley Group	Video Processor Amp	7510N
Camera Corner	Video Switcher	VAM2000
	Video Frame Store	AG800
	Remote Control (above unit)	
	Floppy Disk (above unit)	
	Sony Camera/Recorder	CCD-V99
Horack Refrigeration Co.	Genie Pneumatic Lift	
	(Antenna mast)	
Central Fabricator, Inc.	Pneumatic Lift Base Plate	
	(Custom fabrication)	

On another subject, I wrote to you recently regarding a frequency coordination change for my system (AD9W/R) up on Rib Mountain, near Wausau, Wisconsin. I'm pleased to report that the frequency coordinator allowed a change from 439.25 Mhz lower VSB to 434 Mhz upper VSB. 73, Dean Andrewjeski, AD9W P.S. I have a for sale item: PC Electronics TXA5-33 1 watt ATV transmitter board crystal on 923.25 Mhz - $100.00

THE FLIGHT OF SPECTRA III FRANKLIN HIGH SCHOOL DUAL-BALLOON SUCCESS

By Chuck Crist, WB9IHS

On March 21, 1992 at 7 a.m., the Franklin Community High School aero-space class launched their third high altitude balloon experiment. These experiments were part of a continuing school-sponsored program aimed at teaching weather and communication satellite techniques. The students actually got a chance to design and build their own "satellites" and launch them to the edge of space with balloons to simulate the real thing.

Figure 1 ***Franklin Community High School Aero Space Tech Class eighteen students with instructor Mr. Craig.***

Two separate balloon payloads were launched from the baseball field at the school. The first balloon package carried aloft an actual aircraft transponder (donated by TERRA Transponders of Albuquerque, New Mexico) and a 2 meter 300 milliwatt FM beacon (built by Dan N9KZH) with a tone-modulated CW ID. The second balloon package consisted of a Wyman Research ATV transmitter on 439.25 Mhz with on-carrier sound, a 2 meter FM receiver, a 10 meter FM transmitter on 29.6 Mhz, and a 100 milliwatt CW transmitter on 28.322 Mhz. Anyone heard coming in on the 2 meter uplink would be repeated out on the ATV on-carrier sound frequency as well as the 10m FM output. The idea was to link up a number of classrooms across the Midwest using the balloon as a cross-band repeater. In addition to the amateur radio payload, a separate Samsung AF-SLIM camera was attached loaded with special infrared film. The camera was set up to take a picture automatically every 10 minutes. Thanks to the special film, a series of very detailed and spectacular photographs were obtained throughout the flight.

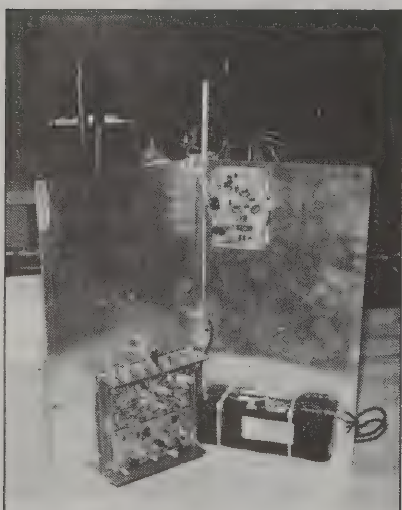
The first balloon (with the transponder) was filled with just enough helium to lift the payload and barely left the ground when it was released. It finally headed leisurely up towards the edge of space. The second balloon was filled with an abundance of helium and had plenty of excess lift. At liftoff, it zipped up at over 1500 feet/minute, almost as if it were helped along by a rocket.

Since the second balloon carrying the ATV gear and the cross-band repeater was zipping along much faster than the transponder balloon, it reached it's maximum altitude (about 90,000 feet) in about 1.5 hours. Along with spectacular aerial views of Indiana and the Ohio River, the cross-band voice repeater saw a good deal of activity. Since the ATV transmitter operated with on-carrier sound (FM voice modulation of the center carrier) anyone with a 440 MHz HT could tune into the voice activity just by tuning into the center carrier of the ATV signal.

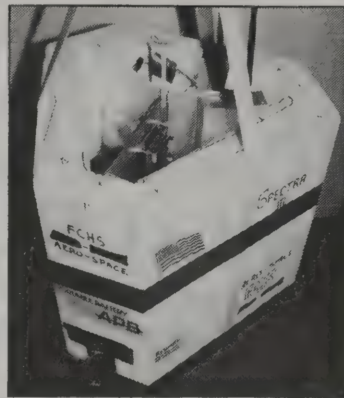
At least 3 schools were able to work through the repeater and over 50 individual stations in a several state area were able to establish contact with the student operated communications center at Franklin High School.

The ATV balloon burst over extreme southeastern Indiana and the package plummeted back to earth when the

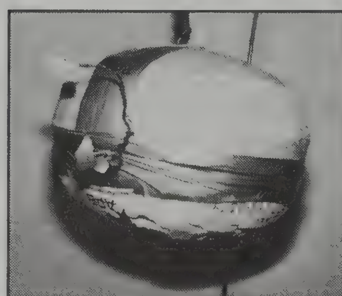
parachute fouled up. Fortunately, the payload managed to just make it over the Ohio River to land near Warsaw, Kentucky. The payload was found just over an hour after the landing in reasonably good shape considering its rapid descent. Good ATV reception was reported in several midwestern states and one school in Olds, Alberta, Canada reported receiving not only the 10 meter transmissions but the 70 cm on-carrier output of the balloon repeater as well (a remarkable distance of 1500+ miles on UHF). The 10 meter CW ID was heard by Bill WA6YPE in Glendora, California even after the landing (the 10 meter dipole was draped over two bushes).



Long after the ATV package had landed, reports from across the Midwest reported hearing the very strong 2 meter FM output from the first balloon. Since the first balloon was filled with very little positive lift, it took over 3½ hours to complete the flight. Due to the increased flight time, the payload drifted across most of Kentucky and landed near the town of Isonville, Kentucky, over 180 miles from the launch site. The intrepid Indianapolis fox hunters finally located the payload hanging 70 feet up in a tree around 11 p.m. After numerous theories of the proper method for payload removal from the tops of trees, a local resident, Mr. Julian Fyffe, came up with the solution. He said, "If I were you, I'd chop that tree down." Julian disappeared for a couple of minutes and reappeared with a chainsaw. He chopped down the balloon-eating tree in no time at all. All the chase crew had to do was to walk up to the top of the tree and pluck the package from the formerly lofty branches. I understand that chainsaws are now standard equipment on any balloon chase.



A special thanks go out to the following flight sponsors: Wyman Research, Avex Portable Battery, Samsung Cameras, Terra Transponders, Milo & Assoc., Inc.



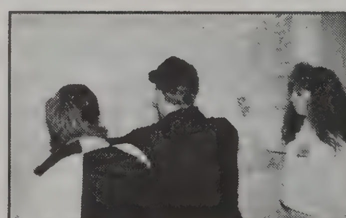
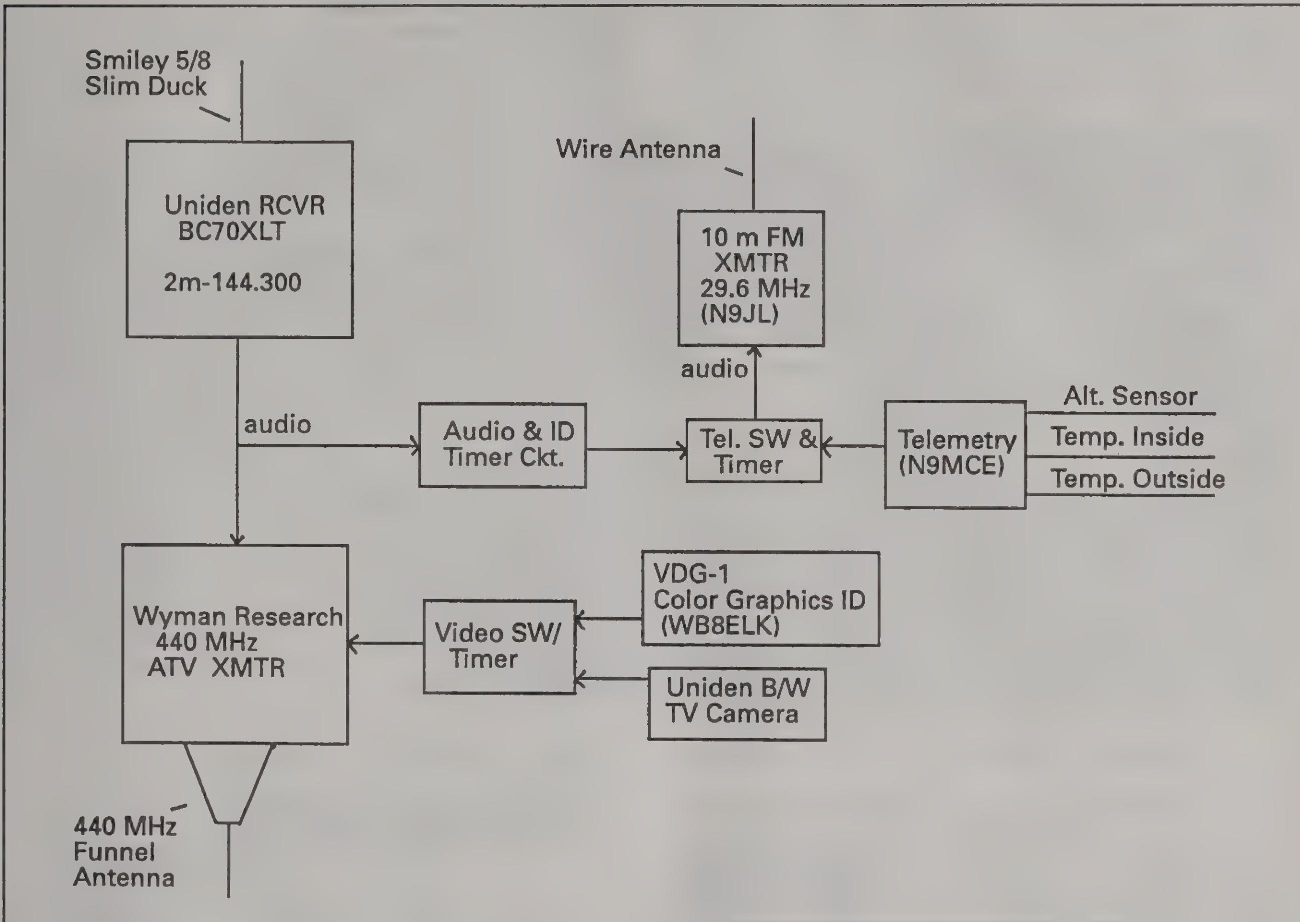


Photo below. FCHS students prepare the balloon for liftoff.
Photo left. The main balloon payload.
Photo lower left. All components were mounted on a triangular metal framework inside of the styrofoam package.
Photo third down. The 2 meter beacon designed by N9KZH flew on the transponder balloon.
Photo bottom left Aero Space students track the two balloons position based on reception reports and tracking information from the chase team.
Photo upper left Some of the ham members of the launch and tracking teams. Front row (l to r): Chuck WB9IHS, Dave N9MCE, Seth KB9BGV, Doug Craig, Ron KA9VWR and Darrel KM9S. Back row (l to r): Dan N9KZH, Paul W9DUU, Dave KN9E, Pat WB9IQI and Mike N9MNP.
front cover Photo Dramatic view of the edge of space as seen from over 90,000 feet.
inside back cover Photo Another spectacular view as taken from the film camera onboard the ATV balloon package.

SPECTRA III

Figure 1. The FCHS balloon system diagram.



The FCHS Balloon Team

Doug Craig	Project Manager
Chuck Crist WB9IHS	Project Director
Pat Crowe WB9IQI	Assistant Project Manager
Ron Hamilton KA9VWR	Flight Communications
Dave Distler KN9E	Launch Program Director
Steve Smith WA4VWV	40 Meter Net Coordination
John Goolby WJ9U	10 Meter Net Coordination
Bob Rogers	FAA Tracking/Communications
Rick Tyre N9HLL	ATV Downlink Director
Mike Sercer WA9FDO	Video Records
Seth Rossman KB9BGV	Launch Team Coordinator
John Lutz N9JL	Technical Advisor (10 Meter Payload)
Darrell Sego KM9S	Technical Advisor (2 Meter Payload)
Dave Latsch N9MCE	Telemetry Coordinator
Mike Crist	Balloon Fill/Launch Coordinator
Mike Rosemark KA9VMR	Weather Coordinator
Ron Pogue KD9QB	Chase Plane
Ken Jessup	Pilot of Chase Plane
Dan Trogglin N9KZH	2 Meter Transmitter Beacon

Chase Team

440 Mhz

Tom Curran N9DZJ
Cliff Vaught N9FHF
Bernie Hefferman KB9AWS
Larry Oaks WB9YAJ

2 Meters

Dan Trogglin N9KZH
Malcolm Mallette WA9BVS
Paul Bohrer W9DUU
J. R. Denney N9GWD

Students

Darren Rasmussen
Sandi Winter
Tim Smock
Randy Miller
Kelly Puckett
David Smithers
David Young
Brian Ferris
Heather Kuntz
Jenny Reed
Chris Williams
Andy Bayliss
Lorrie Whisler
Bob Bufton
Andreas Sohmlein
Chad Lamasters

Balloon Launch
Franklin Community High School

It is Saturday, October the 10th, 1992. Another cold day in October. Well, it must be time for another FCHS Balloon Launch. It is dark outside, t AM and everyone is getting out of bed scurrying around looking for their shoes and socks and warm clothes. They are getting ready to meet at the school by 6 AM. The Launch is scheduled for 7 AM and much must be done to get ready even though much was done Friday, the day before. It takes a lot of preparation for one of these flights.

As we arrive we see several people scrambling around trying to figure out what to do. Some others know what to do and they are doing it. Radios are being set up so we can talk to other schools and also to our ham buddies later. The ATV station is almost ready. There are cables running everywhere inside and out. A television set is set up for parents, teachers and students to watch the progress and ATV from the balloon package.

We can see about 15 or 16 students getting their badges, hats and last minute instructions. Two students have just left to go the Air Traffic Control Center to track the balloon on radar. They will be helped with this by Steve Selke.

The students are split up into groups. Some will be tracking the balloon and marking the map. (They have Zebra striped hats.) Some will be talking on the Radio with the help of Seth Rossman, KB9BGV. They have white hats. Students with fuscia hats will be helping Dave Crockett, WA9ZCE, at the ATV station. The launch team, with Pat Croft, WB9IQI, and Chuck Crist, WB9IHS, will be wearing orange hats. Don't forget the Camera Crews. We have got to have photos and video of this event. Mike Sercer, WA9FDO, is in charge of video tapes. John Strauser from the FAA took care of the photos.

Mike Wetzel, W9RE, ran the 40 meter talk net on 7226 K. Dave Latsch, N9EMC, was in charge of telemetry on the package and Darrell Sego, KM9S, was flight program director. Ken Jessup, once again, was the chase plane pilot and Ron Poque, KD9QB, handled communication from the airplane. And again, Paul Bohrer, W9DUU, headed the infamous chase team, and brought the package back alive.

The students participating in this project were Doug Craig's aerospace class from Franklin Community High School. The flight was named "Hermes" by the students in the class which demonstrated satellite simulation performance for them. It was probably the most successful and organized launch of all that have been done at the high school. Everyone was busy nd seemed to know what to do. You know what they say, "Practice Makes Perfect".

The balloon was a TA 2,000 made by KAYMONT and went to a height of about 120,000 feet before it burst 68 minutes after take off and landed 20 minutes later. On board there was a TERRA transponder, radio, camera, TV parachute and the telemetry. The package was found in a cornfield east of Richmond, Indiana about 73 miles from the launch site. It was located by the fox hunters around noon and returned the same evening. "Thanks to all the fox hunters."

This is a very special event for all who participate, students and hams alike. It is educational for the students as well as a lot of fun. We all benefit by working together on the project and I am sure the hams have as much fun as the kids...and who knows, maybe some of them learn something too.

Balloon Ham Helpers

Darrell Seco, KM9S - Flight Program Director
Mike Wetzel, W9RE - 40M net
Ron Pogue, KD9QB - Chase Plane
Seth Rossman, KB9BGV - Flight Communication
Dave Crockett, WA9ZCE - Flight Video
Dave Latsch, N9EMC - Tel. Coordinator
Mark Garrett, KA9SZX - Tracking Map
Dan Troglin, N9KZH - Tel Xmtr
Pat Croft, WB9IQI - Assistant Flight Director
Mike Crist - Team Launch
Steve Crist - Video
Mike Sercer, WA9FDO - Video Tapes
Paul Bohrer, W9DUU - Chase Team
Ken Jessup - Chase Plane Pilot
Steve Selke - FAA Tracking
John Strauser - FAA Photos

Chase Team

Tom Curran, N9DZJ
Malcolm Mallett, WA9BVS
Dan Troglin, N9KZH
Keenan Hardesty, N9HCK
Keith Hardesty, WB7SFI
Jay R. Denney, N9GWD
Kevin Hartzburg, N9FWB
Larry Oaks, WB9YAJ
Mark Shaffer, N9PUF

Charles W. Crist, WB9IHS - Flight Director

I GOT MINE, DO YOU HAVE YOURS?

CLOSE OUT SPECIAL

The ATVQ Indian Head Test Pattern coffee mug. Just the thing to add class to your shack and hold your favorite bev-erage! Holds 12 oz. This fine china mug is a limited edition with the famous test pattern on one side and the famous ATVQ logo on the other. The colors are TV black for the art work and antique tan for the cup. Shipping weight is over a pound! This is a quality product and not available anywhere else. Show your video hobby with pride or use as great gifts for video friends.
Only \$5.99 plus postage (\$2.90 US, \$3.50 Canada). Satisfaction guaranteed! Send your order to **ATVQ, 1545 Lee St. Des Plaines IL 60018. FAX 708 803 8994 Visa/Mastercard.**

VISA

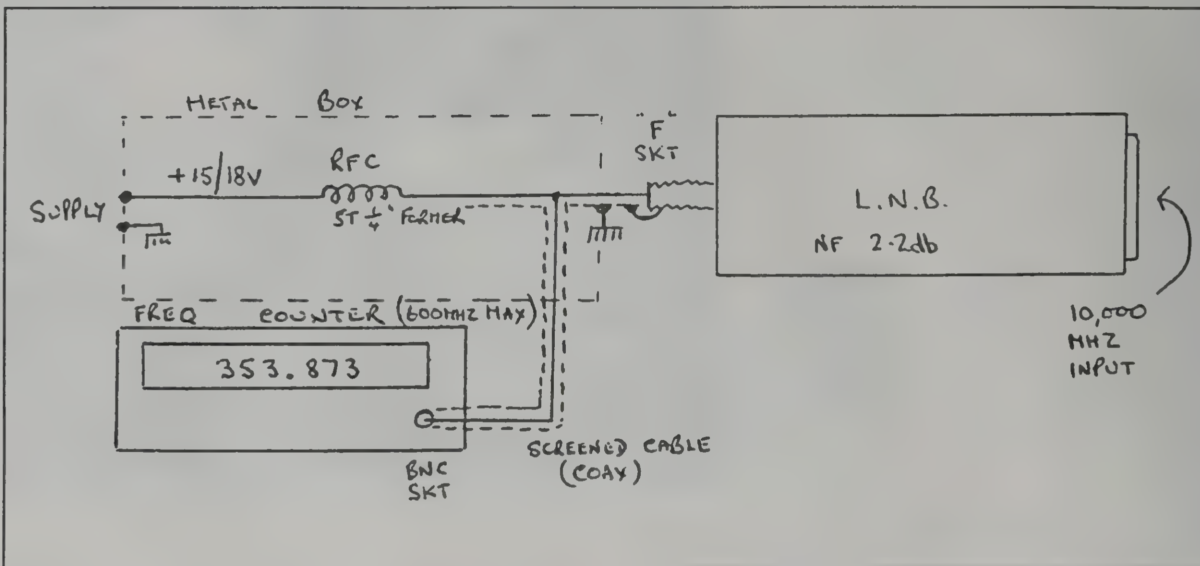
MasterCard

I CAN LET YOU HAVE THIS TRIPOD FOR 1/3 OFF. IT'S ONLY MISSING ONE LEG

WOW, HE REALLY **IS** JUST VARIOUS SHADES OF GRAY--- I THOUGHT HE WAS USING A BLACK AND WHITE CAMERA!

A Cheap 10 Ghz Frequency Measuring Device

John Hudson, G3RFL



At one of the rallies, I purchased some LNB's with a poor noise figure of 2.2 dB that most people did not want - for only £3.00 each!

I was informed by a friend that the local oscillator works on 10,000 Mhz. I was playing around with some Gunn Diode transmitters which worked in the region of 10,350 Mhz and began to wonder what output I would get from the LNB IF output if I placed the transmitter in front of it?

I have a cheap Maplin 600 Mhz frequency counter and connected this to the LNB IF output. To my surprise, it read 350 Mhz! (10,350 - 10,000 = 350 Mhz). Upon tuning the voltage controlled transmitter, it gave an output from 350 to 500 Mhz. This was not my transmitter, so I did not see how low in frequency it would go (Gunn diodes being negative resistance devices, too low a control voltage can cause a fatal current to flow.) At this range, it worked over several feet.

All that is required is a simple tee junction so that the LNB may be supplied with 15 to 18 V dc (see diagram below).

When playing at these frequencies, any test equipment is better than none. If at sometime one can gain access to a know frequency source, then it would be possible to determine what the error factor is. I left the transmitter on for several hours to allow it to warm up and settle down, then I switched on the LNB and measured the frequency output of the LNB. The results are as follows:

TIME mins	LNB LF OUTPUT Mhz	ROOM TEMP degC
0	353.873	21.6
2	353.930	21.6
5	353.909	21.6
10	352.501	21.6
20	351.609	22.1

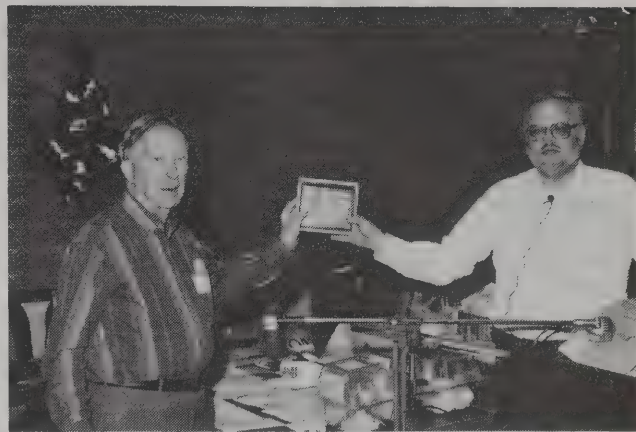
Generally it was within a few Megahertz in 10,000. Some of this error could have been the transmitter drifting or the room temperature rising slightly.

It's cheap and it works - why not try it? 73's from John, G3RFL.

From Severnside Television Group newsletter P5

For subscription write Shaun O'Sullivan G8VPG, Severnside Television Group, c/o 15 Witney Close, Saltford, Bristol, England BS18-3DX

Sixth Annual ATV Dinner Litchfield, Illinois - 11/28/92



As the Christmas holidays approach, one event that is eagerly anticipated is the Central Illinois - St. Louis, Missouri area annual ATV Dinner. This year was no exception with another new record of 66 people attending from as far as WBØOOL's friends from Sidney, Australia. As in years past, the event was held at the Ariston Restaurant in Litchfield, Illinois.

The group started to assemble at 5:00 p.m. for happy hour, to make new acquaintances, and renew old friendships. The room which was decorated in holiday attire with some special decorations by WB9QLY and niece, Amy Bishop.

At 6:30 p.m. K9SM called the dinner to order. Cindy, N9GNZ, offered prayer and the clatter of dishes and instruments blended with chatter from the various tables and holiday music reinforced the congeniality of the atmosphere. Many pounds were gained that night from the specialty of the house, Prime Rib, other menu specialties, and those famous Ariston desserts.

The program began with the awarding of several special awards for special events during the past year. This year KDØLO, KD9CN, and KB9DU were given the awards for humorous incidents that they were involved in. A special award, The Order of the Antenna, were presented to KD9CN, K9RRP, WD9ENR, and N9NEP for their help with K9SM's recent antenna addition and their hours of dedication on a cold November day.

This years' award for Central Illinois/St. Louis Area Amateur Television Operator of the Year was given to K9KKL, Bill Bryant, from Springfield, Illinois. Bill is an early ATV pioneer in this area and has given a lot of assistance and help through the years with his expertise. He has also attended all of our dinners and helped with the Old Settlers parade since its beginning. His help and guidance has been appreciated through the years by all in the group. Thank you, Bill!

Next on the agenda was the program. This year Ben Kiningham, K9IDQ, gave an interesting talk about his job with the Illinois News Network. Ben covers the statehouse in Springfield and told us how the network operates as well as some humorous out-takes on tape from those not aired.

The program concluded with the famous double draw for prizes donated by many generous contributors. Everyone looks forward to the drawing and the chance of winning anything from a magazine to a new downconverter or antenna. The children draw the names and the lucky person draws a number which corresponds to a number attached on a prize.

As the drawing came to an end, the program was concluded and everyone said their farewells and holiday wishes and went their merry way. A good time was had by all and everyone looked forward to next year's dinner.

PHOTO #1 The group at the Ariston Restaurant in Litchfield, Illinois,

PHOTO #2 Bill Bryant, K9KKL, receiving the Central Illinois/St. Louis Area Amateur Television Operator of the Year - 1992 award from Scott Millick, K9SM. K9KKL is on picture left and K9SM on picture right.

After 8 months...
Deer Hunter Finds DARA Balloon
Dave, AH2AR/8

On 25 November, Dave Pelaez, AH2AR, received a telephone call from Doug Dickess, a resident of Portsmouth, Ohio. While deer hunting northwest of Waterloo, Ohio, Doug came across an unusual package hanging in a tree on the side of a ridgeline. After cutting down the package, Doug examined the curious box and found a reward note and telephone number inscribed on the package.

He called Dave (the number on the package) and scheduled a meeting to have Dave pick up the package he had recovered. The following Sunday Larry, KB8EMD, Ron, KB8GUE, and AH2AR drove down and retrieved the package.

Examination of all of the electronics within the payload revealed that everything was in working order. The 2 meter simplex repeater, both black and white TV cameras, the ATV transmitter, the high technology flight (HTF) microprocessor-controlled telemetry overlay, the 35mm camera and 10 meter beacon all were in excellent condition. Although the 35mm photographs taken by the onboard camera were somewhat of a disappointment (since the camera malfunctioned at about 10,000 feet), the camera itself was amazingly unscathed.

Eight months in the top of a tree is not the best place to store sensitive electronics, but the robust package construction helped keep the cameras and electronics from getting water damage.

Dave plans to organize another high altitude balloon launch sometime in late spring. He's currently working on a scheme to include a long-term 2 meter QRP beacon, so swift recovery of the package (in the event it lands in a remote area) will be assured. Although the eight month recovery time is not the longest record (one group's package was recovered after 23 months), the utilization of a 5 day beacon will make recovery a less risky venture.

NEW PA ATV RPT

The Western Pennsylvania area will see yet another ATV repeater on line. We now have W3KWH (439 in 425 out), W3NBN (439 in and 421 out). Along with these fine repeaters will be KA3FZF (434 in and 923 out). This repeater will boast genlocked ID's over live incoming video. Animated ID's in 4000 colors. Computer generated voice ID's. Linked Audio with 145.25 output. Time Base Corrected video output on 900 Mhz. The heart of the repeater will be an Amiga Computer. The transmitter will be PC Electronics.

The group of fellow hams who are spearheading this project are preparing a newsletter. This local newsletter will be mailed quarterly and will contain articles of interest to the tri-state ATV operator. This information will allow us to mae decisions about ATV operation in our area. We see ATVQ as a national trade magazine. We understand the importance of the magazines input to our hobby. We also see the need for local input as well. After all, we (in Pittsburgh) can not launch a balloon flight with the success of ATV groups in the midwest. Our 2 airports and thousands of miles of overhead power lines for industry would be the first of many problems we could not solve. We must deal with our hobby in our own way. The T-Mark plan does not fit here as well as other areas. We must organize and cooperate on a regional basis. The KA3FZF repeater, and it's newsletter will be a voice for local ATV operators. We will be sure you are involved as well.

Terry Churchfield, K3HKR

Southern Louisiana UHF Television Society

WDØGIV ATV Repeater 439.25 In/421.25/Out
Horizontal Polarization
Local Talkback Repeater NN5F 145.46-6(PL)
*DX Talkback 144.23 USB/3.878 LSB**

**(Subject to change)*

A note about the Southern Louisiana UHF Television Society. We are a loose group of individuals with a common interest in amateur television. There are no dues and an informal net is held Friday night at 9 PM on frequencies listed above. The repeater is owned and maintained by one individual and donations of equipment or other help is appreciated but not required. Some of the features on the repeater are ID test timer for tuning up on the Rptr's signal, color weather radar, and sky cam overlooking the city. The Baton Rouge ATV'ers have a similar camera overlooking that city. We use standard television signals, video and audio compatible with your TV, VCR and camcorder, also computer if it has a composite output. Some members have mobile or portable units which provide some interesting viewing. All are welcomed to look in or transmit (tech or higher license). "See" you on the air.

New Electronic Kit Catalog

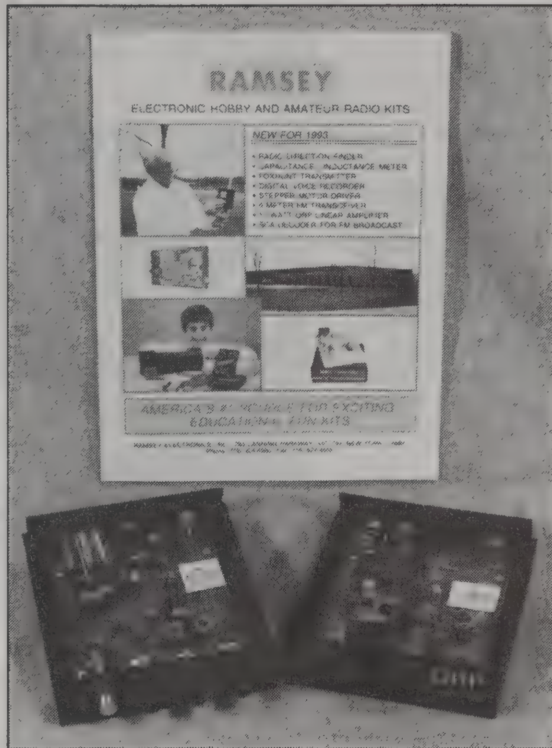
Ramsey Electronics, Inc. 1993 Catalog

Victor, NY, December 10, 1992 -- Ramsey Electronics announces their expanded-format, new 1993 catalog, containing 20 pages of kits and wired equipment for amateur radio, two-way radio, scanner buffs, schools, test labs and electronic hobbyists. Exciting new products include; Radio direction finder, Digital voice recorder, Capacitance-inductance meter, SCA music adapter, Stepper motor driver, Foxhunt transmitter and many more.

The DF-1 Radio direction finder employs new concepts in making direction finding easy. Digital filters and synchronous detection are used to make "zeroing" in on unknown transmitters easy. The direction finder can be used with virtually any radio receiver and only requires connection to the radio's speaker jack. Usable from 100 Khz to over 1 Ghz, the DF-1 is limited only by the receiver connected. Additionally, the DF-1 may be used with walkie-talkie units - even when transmitting. Circuitry inside the direction finder will sense when the user transmits, and electronically switch antenna connections for transmission.

Ramsey Electronics has supplied kits to the hobby, amateur radio and educational market since 1976 and ships worldwide as well as having dealers throughout the US and Canada. New instruction manuals are designed to educate and provoke additional ideas and experimentation with the kits after assembly.

To receive a free copy of this new catalog, contact: Ramsey Electronics, Inc. 793 Canning Parkway Victor, New York 14564 Phone (716) 924-4560 Fax (716) 924-4555



A New Maryland/Pennsylvania ATV Society

John Jaminet, W3HMS

During the 4th Annual ATV Seminar held on 26 September 1992 in York, we made plans for area representatives to meet again in early November to set up a regional ATV society centered around the areas of Philadelphia, PA, Baltimore, MD, Wilmington, DE and York, PA. The name of the society will be defined in due course.

The objectives are two-fold:

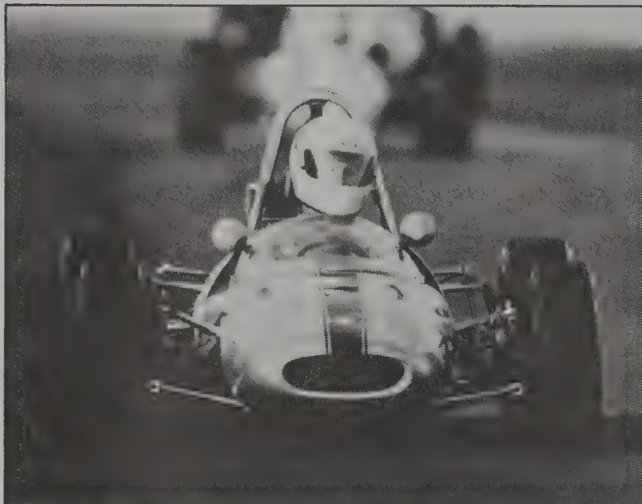
1) Promote the exchange of the latest ATV information among the members.
2) Promote the establishment of video networking between these geographic areas.

The group will have approximately four meetings per year in March, June, September and November of 1993 at a centrally located site, often at Poor Jimmy's Restaurant on Highway 40 near Elkton, MD.

The specific officers needed by the group will be defined at the next meeting. Ron Cohen, K3ZKO, of Philadelphia, Captain Video Emeritus, was elected as Interim President. Regional coordinators were also named.

They are Ron Cohen, K3ZKO, for Philadelphia area, John Jaminet, W3HMS, and John Shaffer, W3SST, for York area, Bob Bennett, W3WCQ, for Baltimore area, and Dave Stepnowski, KC3AM, and Andy Alvarez, N3CUJ, for Wilmington area. Ron Cohen, K3ZKO and the Philadelphia region are responsible for planning the next meeting to be held from 1000 to 1200 and 1300 to 1600 on Sunday, 7 March 1993, at Poor Jimmy's Restaurant, 2360 Polaski Highway (Route 40), Northeast, Maryland, about 12 miles south of Elkton, MD. The buffet and other costs will run about $10.00. Talk-in will use the 146.85 Mhz repeater or 146.70 Mhz simplex. For additional information, contact Ron Cohen, K3ZKO, at 215-379-5338, or John Jaminet, W3HMS, at 717-697-3633, or by packet at WB3EAH. 73 de John, W3HMS.

RACE CAR ATV



Please allow this letter to serve as an introduction to myself and to what I believe to be a unique project. I am both a ham and vintage racecar enthusiast. The idea of combining both hobbies is the basis of this letter, and I am writing at the suggestion of Jim Newcomb (Advanced Electronics Applications).

Vintage racing is a hobby/sport that has grown in the number of participants and spectators through the years, and in the sophistication of racing machinery. There are now dozens of regional sanctioning bodies within the United States, operating under a national counsel. A similar situation exists throughout Europe and Japan. Driver licensing requirements are rigidly enforced to insure competence and safety on an international scale. There are standardized technical inspections before every race, as well as review of each driver's personal and car logs. While vintage racing is still racing, it is considered "gentlemen's racing," in that outright competitive driving is discouraged. There are now several magazines that cater specifically to the hobby at both regional, national and international levels.

I have been racing a 1967 Lotus 51-A Formula Ford since completing a 2 year restoration project on this vintage formula car in 1991. I am licensed to drive both vintage and current level racecars by three sanctioning bodies, the Sports Car Club of America (SCCA), the Rocky Mountain Vintage Race Group (RMVR), and the Vintage Auto Race Association (VARA). I am also insured by all three.

I have enclosed a few articles regarding my car, its unique history, and my driving abilities as well as magazine covers from both a regional and international publication. I have also included a full color "action" photo taken when I last competed in the Palm Springs Vintage Grand-Prix.

At this point you may be asking, "what about the ham radio part!" First licensed at the age of 11 as a novice (WV6ISG), I was relicensed as an Advanced (N6HII) in preparation for a two year "sabbatical" aboard a 40 foot cutter-rigged sailboat. "Double handing" with my wife, we covered over 14,000 miles of blue-water sailing. Ham radio played an important part of the trip via an ICOM 720 interfaced to an Apple computer through an AEA CP-1 for RTTY capability. The antenna was a double sloper fed from the top of the aluminum mast, 57 feet above the water. Copy was always reported as "Q-5". The sloper was a significant improvement over the typical longwire or vertical typical in most maritime-mobile installations. Also enclosed is my QSL card I used which shows our marine QTH.

The preamble complete, the experience presented, and the foundation laid, I now "jump into the breach!" How about live, in-car, action video transmitted to the "fans" via ATV? After all, if the "big boys" have live, in-car video in NASCAR, Formula I, and Indy, how about us, the vintage crowd? There were over 20,000 spectators at the last vintage race I competed in, the Steamboat Springs Vintage Grand-Prix. What an opportunity to showcase both amateur radio, ATV and vintage racing! I believe that the various special interest publications, as well as local media where I am competing, would provide additional desirable press coverage to such a unique amateur project.

I believe it can be done modestly, for less than $2,000, and that I have the ability to get the job done well. I can provide the labor but I am requesting sponsorship, in the form of donated equipment, and some technical support. In return, I will carry the name of your company on my car as well as make the output available to the fans and media (with appropriate sponsor identification). I will also write a detailed article for QST (I am an ARRL member) and/or Amateur Television Quarterly. While I can't guarantee publication, I believe I write well, and certainly would expect to be published. (I have written for several magazines, have been published in a number of professional journals, currently serve as an editorial consultant for a national medical periodical, and written for a vintage auto publication, as well.)

My attempt, in this initial letter, has been to plant an idea for what I believe to be an exciting opportunity for all involved. I welcome your thoughts and hope that we might further discuss goals and needs for each of us. I would be happy to provide you with my resume and look forward to hearing from you. Cordially, Stephen G. Thein, Jr., Ph.D. Director Pacific Research Network.

Dear Editor:

Thanks for the informative (well almost) article on SSTV. The two fellows' who wrote the articles are highly respected in the SSTV community. I have exchanged images with the "zipper ripper" on 20 meters many times.

I am speaking from experience. There are a few items these two gentlemen did not discuss. The SSTV operator is unique. Several have attitudes that go beyond egotist. I personally found some of them are very self centered. Some are intolerable!

For example: Many SSTV operators will not send an image in your format, even if you ask them nicely. They will argue that you should be up there with those guys, or down there with those users. They argue that they were on the frequency first and you better wait your turn. There is always a NET CONTROL. This is usually the guy who can send the image 3 or 4 times without complaining. They usually pick the "big gun" for that same reason. You hear a lot of complaints about getting "a hit" in the middle of the picture, "send it again". Do not get into long conversations on the SSTV frequency, somebody will send a picture over top of you, just to be nasty.

. . . because they think it has to be expensive.

For instance: If you do not own one of those fancy computer controlled systems like the Robot or the Amiga, you are passed over during image send and receive. Images transmitted are not in any way compatible. ATV and ROBOT are far from compatible without expensive modifications. The ROBOT 1200C cost about $1500 to do correctly, and that is no good without a computer to save and modify the images (another $1000). The Amiga is very good for what it does, however, the AEA software is bulky and requires lots of memory to run properly. You can slow scan images for transmission on a $79 investment. It does a good job in SSTV, however FAST-SCAN is where it belongs. (My TOASTER is not for breakfast anymore.) The IBM-PC system may be a good choice if you have the bucks for a good VGA monitor (low cost VGA systems can not display 250,000 colors) and some memory. Problems with the IBM include speed, version of DOS and lack of good VGA paint programs to support the required colors. Expensive image frame store can keep the cost high. There is no two ways about it, SSTV is 7 to 10 times more expensive than FAST-SCAN TV. Remember to add the cost of your antenna system and your expensive YAESU into the total investment as well.

. . . simply use your present HF rig.

Next case: No one mentioned the burden you place on your HAM equipment. Most high resolution images require at least 32 seconds to send. Some go as high as 3 minutes (3D images for special viewing glasses on the Amiga). Can your ICOM or KENWOOD handle 3 minutes of KEY DOWN, 100% modulation, full power output? Check that information with your manufacturer first. Notice I did not mention using an amplifier. Ouch! What a thought! On the plus side, you can send a low resolution BLACK & WHITE image of your pet in 8 seconds. Try sending a picture of your crowded HAM SHACK with you in front of the rig, in 8 seconds and all you get is mush!

. . . can get a picture of my DX contact.

Sure you can. Most DX contacts take 7 to 10 seconds to complete. You say hello, exchange a few pleasant facts and 73's. If QSB, QRM and ever-weakening signal conditions are a problem at 10 seconds, imagine what the image will look like at 32 seconds. Imagine trying to get a "header" for some special modes in those conditions. "I am sorry I did not get the start pulse. Send it again." You better hope the rare DX station has high tolerance to frustration.

. . . no need for a great location.

[deleted]!

Those are just a few arguments about SSTV that were not covered in the article. To cover my tracks (and yours), compare costs of an average FAST-SCAN transceiver ($300) to the cost of an average SSTV scan converter ($800 and it requires use of your transceiver). Compare the antenna requirements (85% of SSTV sent is done on 14.230), a good TRI-BAND antenna ($399) could cost 4 times that of a good YAGI on 440 ($110). Not to mention the weight. You need a camera for both modes. A VCR would be useful for SSTV if you did not have a computer to save the image. A VCR is perfect for FAST-SCAN and you do not need a computer. You can send images around the world with SSTV (provided someone is looking, and no QRM is around). The FAST-SCAN operator has to deal with contacts only 100 or so miles away (running 50 watts of power, not 1500 watts...ooowe).

To simply close . . . I am not holding my breath for an SSTV satellite link on 14.230! Oh yes, my AEA SSTV interface is for sale. Sincerely, Terry Churchfield, K3HKR 258 Roberts Road, Pittsburgh, PA 15239

CORRESPONDENCE

It is really bewildering to me to read another lengthy anti-ATV article by WA6 I Talk Funny. (Regarding his Westlink letter in ATVQ - Winter, 1992.)

Here's why- it is not the mandatory duty of any ATVers to equal or exceed the video quality of the professional TV stations; especially since their picture quality costs more than 10 times as much for the transmitter, camera and special TV receivers, such as the upcoming high definition, or equivalent.

If the average ATVer has over a thousand dollars invested right now, and we are happy with the past and present picture technology, it doesn't make any sense to pay a giant leap more in money and time to achieve an unappreciated technically-improved picture quality.

Most of us are striving for improved quality ATV communication through every means other than video resolution. Technical examples of improvements would be more efficient and smaller antennas, coax, transceivers and cameras.

Practical improved activities include public event coordinations, nets, computer graphics, demos, repeater linking, sign language for the deaf, etc.

Every ATVer is eagerly striving to learn how we can all improve our ATV picture quality for the same present cost or less.

Serious licensed ATV operators have pride in research and putting on the air the most efficient quality video communications for the least amount of money.

Just after moving into the Korea-town section of Los Angeles recently, I found myself frantically packing two giant suitcases, in the event that the unfought riot fires across the streets to both the east and south jumped to our roof. (No room in either suitcase for any ATV gear.) I was glad during the riot week (and still am) that I had not tried to keep up with, nor surpass the technically better gear that Bill was insisting that we all buy in order to have a picture worth looking at. Sincerely, John Ruckert, WB6ZPN

More Reader Response>>>

Dear ATVQ:

Here is what we did to demonstrate ATV to the people in Sioux Falls, SD:

The Sioux Empire ARC set up a ham radio booth at the Senior Citizens' Hobby & Craft Show, March 20 and 21. Besides sending traffic for the public, N0HCR, WV0K and WA0PBL set up two-way ATV on 427.25.

Members of the public enjoyed seeing Phil, WV0K, on a color monitor. Audio communication was by a handheld on 144.9. The highlight of the ATV demo was when a deaf woman talked to Phil by sign language and he, in return, signed back to her. Roger, N0HCR, said he wished he had a still camera so he could send a photo of it to QST.

It seems to me that the full potential of ATV for the deaf is yet to be realized. I'm sure many deaf would enjoy ATV. Also, a local station, KELO, Channel 11, had a four minute piece on the news about the ATV.

KELO started its piece by saying "It looks like something out of the Jetson's, but ½ dozen Sioux Falls people can see each other".

Both Fred and Phil used PC 10 watt ATV transmitters and cable 58 VCRs. Since Phil lives five blocks away, P5 was possible without elaborate antennas. Hope this will be useful. Sincerely, Fred Lehman, WA0PBL, 1521 South Spring, Sioux Falls, SD 57105

- -

RACE TO THE SKY

The annual Race to the Sky Dog Sled Race was once again held on February 8th, and "hams" throughout Western Montana participated.

Bob, WB9JK, and Jim, K7CCZ, were coordinators for the race which lasted for 7 days and nights.

I, K7IUI, and Don, WB7ETT, set up ATV at the ceremonial start of the race in downtown Helena. We broadcast live video and audio to the top floor of the Park Hotel. I set up at the starting line, and Don set up about a quarter of a mile away to show progress up the "gulch". Among those at the headquarters observing the broadcast were local "hams", race officials and the press. All appreciated the ATV broadcasts.

Throughout the week, members of the Capital Area Amateur Radio Club in Helena and others from Bozeman, Butte, Great Falls, Missoula and Kalispell joined in to provide communication via the 146.85 repeater and packet. For the next few days radio communications were provided 24 hours a day with a variety of checkpoints in all types of weather. Fortunately, no emergencies occurred and only health, welfare, and race statistics were passed. The only other communications available were some commercial handhelds. Without our help telephones (where available) would have been the only long range communication. Needless to say, our help was appreciated.

ATV DEMO

On July 22, 1992 Andy Alvarez, N3CUJ, delivered an excellent presentation and demonstration of live amateur television to the assembled membership of the South Jersey Radio Association (SJRA) at Pennsauken High School, NJ. A lively question and answer period followed the program.

Andy told us how to set up an ATV station, the modest amount and specific kinds of equipment required, the surprisingly low cost involved and how to enjoy simultaneously seeing and talking with other hams.

This was one of the best programs SJRA has had in recent years. For a couple of weeks the program was discussed on the various SJRA nets and daily on the Club Repeater, K2AA.

My son, Frank, WA2VYA, was a principal questioner after the program. He has become sufficiently motivated that he is planning to get on ATV, so I am helping him accumulate information while he accumulates dollars. Hopefully, he will be visible among the central NJ ATV people in the first half of 1993.

Andy is to be congratulated for his contribution to educating the amateur radio fraternity about amateur television. 73, Frank W. Widmann, WAYSW Program Committee Assistant

CORRESPONDENCE

About Bill Pasternak:

Having received the Vol 5 #1 copy of ATVQ with the letter from Mr. B. Pasternak, I feel most compelled to reply to his comments. To begin with, although I have only been on ATV for a relatively short time, I am an Advanced class licensee having been licensed for over 43 years and active on all bands. In addition, I hold a commercial General R/T ticket as well as being a professional engineer. All this to establish some credibility.

Mr. Pasternak apparently feels that ATV needs restructuring to make it more interesting to him. That producing entertainment shows is necessary to revive ATV. He also states he has been "bored stiff" by the material he has watched on ATV, and that ATV will not succeed as it is presently utilized by the Ham community. Mr. Pasternak does not seem to realize that ATV like any other amateur band communications is by law meant to provide just that- COMMUNICATIONS between two or more individuals for the purpose of interchanging information for either personal or technical reasons. What these communications are not meat to be, are entertainment for the general public. We certainly have adequate media for such purposes among radio broadcasting and our regular entertainment TV. With this in mind, perhaps I should state for clarification's sake that we are amateurs licensed to communicate with each other and not for the purpose of broadcasting . Too often have I seen on ATV long videos being transmitted of material which has no reply solicited or even expected. Such antics have no place on our ham bands- be they video, SSB, CW, etc. [ED. QST Bulletins?]

This letter is not meant to define that only technical discussions or communications are to be permissible materials to be sent through our ham equipment. On the contrary, if someone wants to send pictures on ATV with only himself holding a mike, is as acceptable as one depicting the filter capacitor in his transmitter's output. The point again is we are to transmit communications with a reply desired from the other guy- <u>not broadcast entertainment</u>. Mr. Pasternak I feel really needs to find out just why we are licensed as hams and if he does this, I feel certain he would be able to reassess his "bored picture of ATV" today. 73s Roy Hayes, K6CUK 1502 East Sycamore Avenue, El Segundo, CA 90245

CONTINUED>>>

MORE READER FEEDBACK

About ATV covering NEWS:

How have you been? Long time since the old Group W days. I was reading the September, 92 issue of CQ regarding the FCC's proposal on relaxing rule 97.113.

I know you are an ATV enthusiast and once published the only ATV Magazine I've ever seen. I have an idea I would like to throw out to you for discussion.

My proposal is this, let us say you're driving along a road and come across a multi-car accident. It just so happens that you have a camcorder and an ATV transceiver along with you.

Wouldn't it be nice if a local television station perhaps sponsored an ATV repeater and was allowed to broadcast this event live or tape it.

Now keep in mind the only people that would be permitted to do this is licensed hams, and they would NOT be allowed compensation. (This would prevent stations from just sending their staff reporters out armed with a Ham license and Ham equipment to cover stories on a regular basis.) And, most importantly, they would be providing a public service.

During emergency situations, Command Centers could actually view and assess damaged areas. As a secondary source, this could also be used as news material. (The present rules allow Ham radio to be used for Newsgathering when all other forms of communications are down.)

Now there would be restrictions to such use, it would be restricted to the 33 and 23 CM Ham bands and there would be power restrictions, so many people could use the bands, similar to the way telephone calls are allocated.

I think such a proposal would be beneficial to everyone, it would populate the unused Ham bands, it would bring ATV from a specialty mode to mainstream. From your standpoint, Henry, with your Broadcast and ATV experience, you could make a killing designing the remote transceiver units.

The units could be much more rugged than what's on the market now. What are your thoughts on this matter? Sincerely, Mike Hemeon, NS1E

[ED: The FCC allows anyone to eavesdrop and retransmit ham transmissions live or on tape, be it news or whatever. The FCC does NOT allow the station to solicit the ham license holder to cover an event. }

MORE LETTERS

I read your comments about Metrovision and TMARC a few issues ago and could not help writing this letter, though somewhat late. When I was President of Metrovision, a fellow member and I went to a TMARC meeting because we were concerned about voice repeaters in the input band of the repeater causing interference and the club did not need more. We explained our problem and we were told we could not experience too much interference since the spectrum from a VHS recorder was used to set up the repeater outputs within the ATV portion of the band. When I explained a VHS signal and a NTSC signal were not the same, I was met with a blank stare. At that point I knew any further discussions were pointless as the TMARC committee had made up its collective mind.

I would like to suggest that ATV club members get active and attend their local coordinating committee meetings lest the same sort of fate befall them. I like the magazine so keep up the good work.

Warren Bain, N4MWU, 2802 Grovemore Lane, Vienna, VA 22180-7070, 703-573-9619

- -

From: Dean Andrewjeski, AD9W
Sub: ATV Frequency Coordination Comments

Enclosed are copies of my personal comments to the Wisconsin frequency coordinator, Mr. Nels Harvey, WA9JOB. I am replying and trying to be recoordinated for an ATV repeater input on 434 UVSB instead of 439.25 MHz LVSB. I know that you are well aware of this problem all over the USA. It's time to attempt to amend the FCC Rules and Regulations regarding the use of 435 to 438 MHz! Would any of you two individuals be so moved to begin an NPR on this matter? I've also talked to John Gebuhr, WB0CMC on this problem. He has thought about starting a formal NPR but hasn't put anything on paper yet.

To: **Nebs Harvey, WA9JOB**
Frequency Coordinator
Wisconsin Association of Repeaters
P. O. Box 23166
Milwaukee, WI 53223
Sub: **Personal Comments on ATV 434 UVSB or 439.25 LVSB**

I'm not sure where to start on replying to the various comments received from the National Coordinator's BBS. Message number 320 hits the nail on the head regarding FCC Rules and Regulations for repeater inputs and outputs around 435 to 438 MHz. I find in the latest ARRL Repeater handbook (1992-1993) approximately eight states (Arizona, California, Maine, Massachusetts, Nevada, New York, Texas and Florida) running ATV repeater inputs on 434 MHz upper vestigial sideband.

In California and Florida there are several 434 MHz repeater input systems. I asked myself how can these states and individuals run such "coordinated" systems in disregard of FCC Rules and Regulations? I called Tom O'Hara, W6ORG, of P. C. Electronics in California for some answers. Tom is the ARRL Technical Advisor on ATV. He said that Satellite users and ATVers coexist and the frequencies involved work well for both parties. It seems back in the early seventies the Amsat people got the FCC to see their point of view rather than the ATVers.

ATVers were a smaller group of people with a disorganized "voice". Now ATV is growing and Ham's are starting to "see" the picture. They are attempting to salvage what is left of this band and, I hope, amend the FCC rules. (If it works in California, a heavily Ham RF congested area, why can't it work elsewhere?) Tom, by the way, is also on the technical committee for the Southern California Repeater and Remote Base Association (SCRRBA). Tom also mentioned that the ATV repeater inputs do suffer some interference from satellite users but that interference is minor and has been acceptable. Most of the interference comes from the satellite users rather than from ATVers. (Please call Tom O'Hara, W6ORG, for his opinion at 1-818-447-4565.)

I disagree with the attitude or opinion that ATV should move out of the 70 cm band. ATV has just as much a right to be there as anybody. ATVers need an input on this band as well as a repeater output. All the ATV transceivers available today are designed for this band. Equipment for the higher frequency bands costs more money and suffers from higher RF transmission line and free space path losses. Manufacturers therefore target the 70 cm band for the newcomers who want to

get their feet wet and try out this mode of communication. Another advantage on 70 cm is the availability of cable ready TV sets that can tune in these amateur TV signals.

Back in the late seventy's and early eighty's, I was coordinated for an ATV repeater input on 439.25 MHz upper vestigial sideband. The WAR frequency coordinator back then later coordinated an FM repeater on my 443.75 MHz Aural input. The sad part was that the new FM repeater was in my local area. (I believe he didn't understand how much bandwidth is required for AM television. ATV was somewhat new back then.) Anyway, I had additional problems with intermod products and eventually went to use the lower vestigial sideband of 439.25 MHz. Also, packet 442.0 digipeaters were appearing as well and I could see what was either happening or about to happen to the 439.2 MHz upper vestigial sideband area. So the next logical step was to go still lower in frequency where others had gone before. It made sense to me too! With the upcoming Wausau school district project "Dream Flight Wausau" and the sole use of AEA's 70 cm upper vestigial sideband rigs for this project, the switch was made to 434 MHz UVSB. THIS INPUT ON 434 MHZ UVSB WORKS AND DOES IT BETTER THAN ANY FREQUENCY I'VE TRIED OVER THE LAST TEN YEARS! I'm not going to say that everyone should be moved to this spot. If a repeater input on 439.25 MHz UVSB or LVSB works in another area, then that is fine. I know that this is just not the case up on Rib Mountain with the 439.25 MHz frequency location, either UVSB or LVSB. 73, Dean Andrewjeski, AD9W, cc: Tom O'Hara (PC Electronics), Henry Ruh (ATVQ).

- -

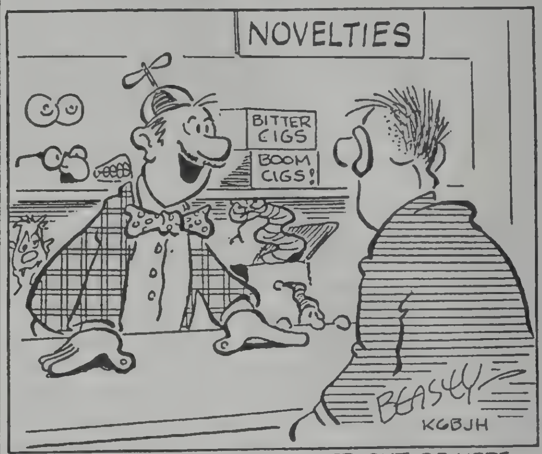
Federal Communications Commission
1919 M Street NW
Washington, DC 20554
Subject: Comments on the Rule Making: RM 7896 (97.113, "prohibited transmissions"

I, the undersigned, would like to express my support of RM 7896. The permission of hams to provide public service communications. The service I render to the Plum Boro (Pittsburgh 15239) community is the broadcast of Amateur Television transmission of local Plum Boro Baseball Association games. The P.B.A.A. is a non-profit organization. The games including boys baseball and girls softball, are taped and edited by K3HKR and then broadcast on 434.0 to all those who have been set up with down converters and simple antennas. These users include the Plum Senior Citizen Center and (soon to be added) the Plum Y.M.C.A.

My coverage of these events has been marred in the past by noise and music being played in the background. It has been very difficult to insert edit play-by-play and edit out music and language not fitting to the transmission.

I do not use any music. I use no sounds that are not directly related (the "cheer" or "crack of bat") to the broadcast. Background noise and music has no direct entertainment value, however, in a situation like this, it is sometimes not prohibited.

The P.B.A.A. offers organized "ball" playing to over 800 families in the community. The ages of these children range from 7 years to 17. The largest body being 9 and 10 year old boys. Some families have four youngsters playing in the league at the same time. Expanding the ATV coverage and allowing RM 7896 to make it more valuable would be a great service to the community. The Amateur Operator of the 21st century must offer his community more than just noise on the TV. He/she must become active in local organized community activities. The proposed RM 7896 will make it easier for them to do so, without fear of doing something illegal or prohibited. Respectfully submitted, Terry A. Churchfield, K3HKR, 258 Roberts Road, Pittsburgh, PA 15239, (412) 795-7228



THE HAM RADIO STORE MOVED OUT OF HERE LAST MONTH, BUT IF YOU'D LIKE TO INDULGE IN A CHEAPER HOBBY, I CAN SELL YOU A WHOOPEE CUSHION!

- -

U. S. NAVAL ACADEMY BALLOON

At 1027 UTC on April 27th, 1991, the Naval Academy amateur radio club launched a helium balloon carrying a 5-channel telemetry payload designed by Midshipman first-class Stohs. The telemetry consisted of three tones reporting the altitude, outside temperature and the temperature inside of the battery pack. The pressure sensor was donated by John WB4LNM but was only calibrated up to 18,000 feet. Two additional channels reported the status of the balloon. Four different CW messages were transmitted depending on the condition of the balloon and the ground contact switches.

When the balloon was in flight it sent out the following sequence: GO NAVY (Tout tone), (Tbat tone), (Pressure tone) W3ADO. The three tones were measured and recorded at the ground station. During the flight a contact switch remained closed due to tension on the balloon string (the string went through the parachute). After balloon burst, the string lost tension and the switch changed the CW message to say: (POP) (Pressure tone) W3ADO. A ground contact switch was used to detect touchdown. If the parachute got hung up in a tree, the ground switch wouldn't be closed and the message would say: HUNG de W3ADO. If the package was on solid ground, then it would relay: QRT de W3ADO.

A unique design of this payload was a solar battery pack to protect the batteries in the -60 degree F. environment at high altitudes. Since alkaline batteries become inefficient at low temperatures, and because this payload was operating on a low duty cycle to conserve battery power, the solar heating was necessary to keep the batteries warm.

Three concentric hemispheres made out of clear plastic provided a triple glazed solar window for the top of the battery compartment which was suspended below the telemetry payload so as to receive full solar illumination. Unfortunately, the solar heating worked too well! The battery temperature rose far beyond our calibrated temperature range. We estimate that the batteries were heated to more than 100 degrees centigrade!

The flight was successful and reached an estimated altitude of 70,000 feet (using a KAYSAM 70G balloon).

Zenith, GoldStar Develop Digital High-Definition VCR

GLENVIEW, IL, Dec. 22, 1992 -- Zenith Electronics Corporation and GoldStar Co. Ltd. have jointly developed a digital high-definition video cassette recorder for home use, the companies announced today.

The new digital HD-VCR, developed for the Zenith-AT&T "Digital Spectrum Compatible" HDTV system is designed to record HDTV signals on standard Super-VHS (S-VHS) videocassettes. The HD-VCR also would be able to record and play back programs in today's TV format using standard VHS tapes.

Unlike other proposed high-definition VCRs for consumers, the Zenith-GoldStar VCR prototype is built around "off-the-shelf" S-VHS head technology, making it very cost effective, according to Wayne C. Luplow, Zenith's division vice president, research and development, advanced television systems.

Zenith and GoldStar expect that the VCR could be sold in the United States for about $1,000 beginning in 1996.

Chai-Woo Lee, managing director of GoldStar's Image and Media Laboratory in Seoul, Korea, said that GoldStar has invested more than $5 million in the 18-month HD-VCR development program with Zenith. About 30 GoldStar engineers in Korea and in the United States have been working on this project, he said.

Luplow said, "The first HDTV sets will be able to receive both standard and high-definition signals so it's crucial that HD-VCRs be able to play standard tapes and record from either source. In addition to enjoying new HD tapes consumers would still be able to play conventional VHS tapes from their home video library and corner video store."

He explained that a number of factors make the Zenith-GoldStar HD-VCR approach very cost effective:

- The HD-VCR would record digitally compressed video and audio, allowing use of conventional half-inch home videotape and recording head technology. (This is a much less expensive design that the wide bandwidth recording approach being developed for consumer HD-VCRs in Japan.)
- To play HD tapes, the HD-VCR would not require video compression decoding, because the HDTV receiver would "decompress" the signal. And, the HD-VCR would not require video encoding and decoding circuitry (like today's VCRs do), to record one program while watching another.
- Economical digital signal processing is achieved because circuitry in the HDTV set, not in the HD-VCR, would detect and correct errors in tape playback and in signals received over the air or via cable.

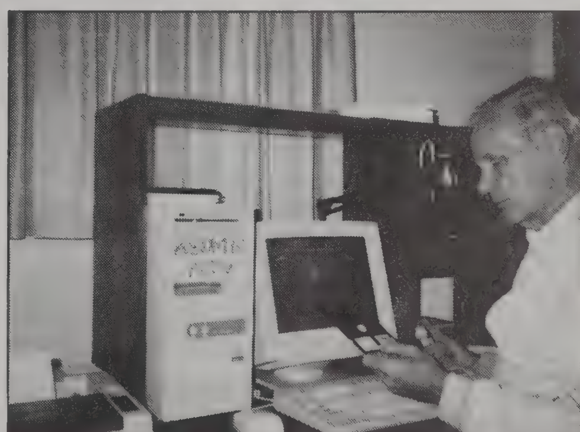
For pay-TV applications, the HD-VCR would record scrambled (encrypted) programming for playback only through an HDTV set

equipped to descramble the pay-TV program, Luplow explained.

"This kind of signal security will finally give Hollywood an incentive to release programming for pay-TV and home video simultaneously," he said. The HD-VCR also would make it possible -- for the first time -- to record one encrypted program while watching another without a second decoder box and without compromising signal security.

The HD-VCR would be able to record and playback two hours of high-definition programming on an ST-120 S-VHS cassette (the same time as conventional VHS recording in the Standard Play mode). A full range of standard VCR features, such as fast forward, reverse, pause and scan would be included in the HD-VCR. It also would feature digital audio with the same high-quality audio found in today's compact disc technology.

CONTACT: Zenith, John Taylor, 708-391-8181
GoldStar, Ken Lee, 312-693-0450



Let me see... the 5.25 go in the longer slot, and the 3.5 go in the smaller slot. Now if I can just find where the "hard" disks go!

New Jersey Bell Cable TV Project Signals New Step In Bell Atlantic's Information Services Strategy

PHILADELPHIA, Nov. 16 -- Bell Atlantic Corporation's (NYSE: BEL) New Jersey Bell unit today announced a 10-year agreement to provide Sammons Communications, Inc., with complete cable TV transport services in three New Jersey communities. This is the first such agreement in the country.

New Jersey Bell will build a video dial tone system during the next two years using fiber optic technology provided by BroadBand Technologies (BBT) that will provide telephone service to 11,700 households in the three Morris County, N.J. communities and will provide Sammons with state-of-the-art digital transport and distribution services for its more than 8,000 customers in those municipalities.

Sammons Communications is the franchise cable TV provider in Madison, Florham Park and Chatham Borough. Sammons, based in Dallas, is one of the nation's largest privately held cable multiple system operators (MSOs), operating 296 franchises with 44 cable systems in 18 states. Through this network of cable systems, Sammons serves more than 950,000 customers and ranks 15th among all cable system operators in the nation. (See following sidebar for details on agreement with Sammons.)

"Video services are a central component of Bell Atlantic's information services plans, and today's announcement of the New Jersey Bell-Sammons agreement indicates that cooperation with cable companies is one way to serve this market," said Stuart Johnson, president of Bell Atlantic Regional Services.

"We define information services very broadly," said Art Bushkin, president of Bell Atlantic Information Services. "From the network perspective, it includes multiple service platforms, such as: voice, text, fax, electronic data interchange, imaging, video, multimedia and others. From an applications standpoint, it covers virtually any service that can be provided through one or a combination of these platforms. These include entertainment, shopping, education, banking, travel, health care and advertising."

"Bell Atlantic intends to bring the information age to our customer's fingertips," said Bushkin. "We will use our digital switched networks to provide consumers with customized solutions to meet their needs and to provide information providers and advertisers with an attractive distribution channel for their products and services."

Bell Atlantic is the parent company of New Jersey Bell, Bell of Pennsylvania, Diamond State Telephone and the C&P Telephone Companies serving Maryland, Virginia, Washington, D.C., and West Virginia.

In addition, Bell Atlantic is the parent of one of the nation's largest providers of mobile communications and of companies that provide business system solutions and financial services throughout the United States and around the world. Bell Atlantic International, in conjunction with Ameritech, owns a majority interest in Telecom Corporation in New Zealand.

New Jersey Bell To Install Advanced Fiber Network To Deliver Telephone, Cable TV and Information Services

MORRIS COUNTY, N.J., Nov. 16 -- Residents of three Morris County communities will receive their cable television service over telephone lines in a unique cooperative agreement between New Jersey Bell, a Bell Atlantic Company, and the current cable TV franchisee, Sammons Communications, Inc.

New Jersey Bell announced a plan today to install an advanced fiber optic network in Madison, Florham Park and Chatham Borough, bringing customers telephone, cable television and advanced information services over the same system.

"This project demonstrates New Jersey Bell's commitment to deploy its most advanced technology where market conditions, economics, and regulatory incentives justify the investment," said James G. Cullen, North Jersey Bell president and chief executive officer. "It also reinforces our intent to meet competitive challenges head on by being the transmission medium of choice for program providers, of which Sammons is the first."

"We are pleased to have developed this business relationship with New Jersey Bell and look forward to offering our customers cable service via an extensive fiber network," said Mark Weber, president of Sammons Communications, Inc.

Under an agreement with Sammons, based in Dallas, New Jersey Bell will deliver Sammons' cable television signals to Sammon's 8,000 customers in the three Morris County communities. New Jersey Bell and Sammons also will work together to develop and test additional innovative services.

This initiative, which is the first large-scale project of its kind in the country, comes on the heels of the Federal Communications Commission's recent video dial tone decision. In that order, the FCC reaffirmed that local telephone companies have the ability to provide cable TV transport to cable companies and permitted telephone companies to offer gateway access services to video information providers.

Pending approval by the FCC, work on the new network will begin next spring and be completed in 1994. It will carry regular telephone traffic, as well as advanced telephone and television services, and will support future services that will change the way customers communicate, learn and are entertained.

"The announcement of this project should leave no doubt that New Jersey Bell is firmly committed to upgrading its network into an advanced, broadband network that eventually will extend to all communities," Cullen said. "We will put the best technological and human resources to work to meet our customers' needs for the variety of services that will be carried over our network."

New Jersey Bell recently filed a plan with the state Board of Regulatory Commissioners called "Opportunity New Jersey" that calls for the accelerated development of an advanced telecommunications network.

"This cooperative arrangement with Sammons underscores our commitment to New Jersey and to our Opportunity New Jersey plan," Cullen said. "Our public telecommunications network has the versatility, capacity and ubiquity needed to meet the information delivery needs of all kinds of information vendors. In addition, New Jersey's progressive regulatory environment makes our state an ideal place to seek out these cooperative ventures.

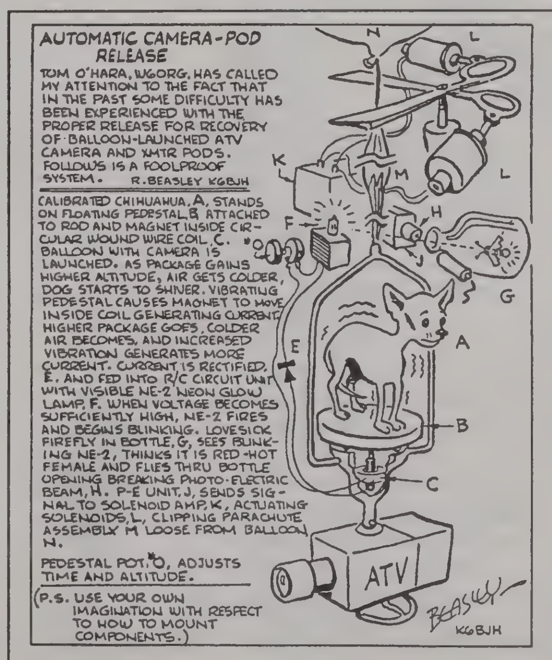
"It's clear that, by agreeing to this arrangement, Sammons shares our commitment to develop and deliver new and advanced services to our mutual customers as the network evolves," Cullen said.

The new fiber network in Morris County will provide the platform for delivery of innovative information services such as "video on demand," which will enable customers to select and view a movie or program when they want to see it. Other capabilities will include transAction services, such as banking and home shopping, education and health care.

New Jersey Bell will replace the existing copper telephone wiring in the three municipalities with fiber optic cable, which will extend to a curbside location near each customer's home. Voice, video and data signals then will travel over a traditional pair of copper telephone wires and coaxial cable into the house.

Installing fiber in the local network will enable New Jersey Bell to reduce maintenance and other costs over time, while opening the door to additional markets.

Additional channels will be available to other information service providers, and negotiations with several such providers are under way. In the future, channel capacity will be expanded to allow customers increased access to additional programming.

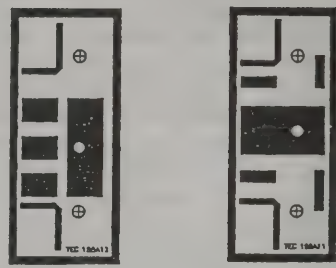


RF Power Module PCB

Tactical Electronics Corporation
P.O. Box 1743 Melbourne, Florida 32902, USA

The PCB is designed to facilitate the use of the RF power modules built by the following companies:

Motorola	MHW series (excluding case 714-04)
Mitsubishi	M series
Philips	BGY series
Toshiba	SA series

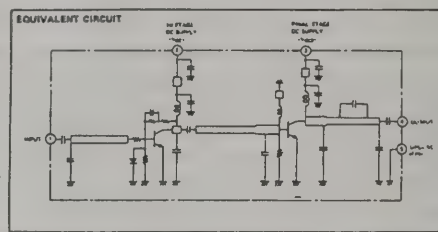


The board allows correctly engineered and easy interface from module to RF and DC. The board pads have sufficient space for installation of C and L values, and any required voltage regulators.

Board material is .031 glass teflon. Usable in most applications to 1.3 Ghz.

Two versions are available. Model 155A11 fits the MHW and BGY series. The 155A12 is for the M and SA series. See below.

Please refer to manufacturer's engineering literature for module technical data. Sample of M57710A data sheet is enclosed. Module suppliers include Richardson Electronics (1-800-797-6937) and RF Parts (1-800-737-2787).



MINNEAPOLIS ATV

Thought I would write you and let ATV Quarterly know what's going on up here in Minnesota (Minneapolis and St. Paul). Different types of antennas are always interesting and challenging to hams so this year again, we had our every-other-year antenna party. The varieties went from Radio Shack corner reflectors, J. Beams, home brews, Klms, Rib cages, M2, and Alford slots. This year we did not have access to Hewlett-Packard measuring equipment, so we used a commercial TV field strength meter.

The M2 was No. 1 in gain; it measured 20 on our scale. There were no Klm-27's or Rutlands on the ground, but we felt that these all were about equal. No. 2 was a Klm-14; it measured 18. An eight element quaggi got 15, as did the J-Beam 48. Cushcraft 11 got a rating of 11. Rib cage (omni-directional) made 4. Corner reflector made 10. The Alford slot tube made 5 (omni-directional). Last was the simple folded dipole with a score of 1.

The last antenna was our new dual Alford slot, but Murphy came along so no rating was available. After repairs and at a later date, we tried it again; first the top section, and then the lower half, and both combined. The gain of the combined sections was on the meter very little above the gain of each of the two sections, but P picture ratings was at least a 2 over the single sections. For a non-directional antenna, these seem to be very successful. Up to now we have used Rib cages on our repeaters, and they have served us very well.

This year's antenna party was limited to the 70 cm range. Our 900 and 1200 link antennas are scheduled for next year.

Henry, I hope this will give you some idea of interest up here ... which is very high. By the way, we like your magazine.
Rollie Paulson, KB0GL Minneapolis, MN

TESTING COAXIAL LINES

Budget applications of TDR can solve transmission line problems

By Don Kolbert

When dealing with transmission lines, such as line pairs and coaxial cables, a few electrical parameters have great influence on the cables' ability to transfer energy from one place to another. Among these are surge impedance (Z_0), the dielectric constants (k) of the insulating materials and the velocity of propagation (V_p) of electromagnetic waves, both in free space and within the transmission lines.

In a coaxial cable, with a single center conductor and an outer conductor, the surge impedance is determined by this relationship:

$$\textit{Equation 1:}\quad Z_o = \frac{138}{\sqrt{k}} \times \log_{10} \frac{D}{d}$$

wherek = the dielectric constant of the insulating material

D =the inside diameter of the outer conductor

d =the outside diameter of the center conductor

In 2-conductor transmission lines, the surge impedance is determined by this relationship:

$$\textit{Equation 2:}\quad Z_0 = \frac{276}{\sqrt{k}} \times \log_{10} \frac{2S}{s}$$

where k =the dielectric constant of the insulating material

S =the spacing between the centers of the two conductors

s =the diameter of the conductors

(Diameters and spacings can be measured in either centimeters or inches.)

If the inductance and capacitance per foot (or meter) of the transmission lines are given by the manufacturer, the surge impedance can be calculated by this relationship:

whereL =quoted inductance per unit length

$$\textit{Equation 3:}\quad Z_0 = \sqrt{L/C}$$

C =quoted capacitance per unit length

Note that the actual *length* of the line is not a factor in any of these formulas. The surge impedance of the line is independent of cable length, and wholly dependent on cable type.

One common variety of ½ inch foam dielectric coaxial cable has an inductance per foot of 0.058 microhenries (μH) and a capacitance per foot of 23.1 picofarads (pf). Its surge impedance is therefore:

$$Z_0 = \sqrt{(0.058 \times 10^{-6} / 23.1 \times 10^{-12})} =$$

Most transmitters use 50Ω or 52Ω coaxial transmission lines to feed energy to an antenna. (Translator manufacturers offer either 50Ω or 75Ω lines.) Receivers have traditionally employed 75Ω or 300Ω input impedances. The 75Ω may either be coax (single-ended) or 2-conductor (balanced), and the 300Ω is 2-conductor balanced (commonly called "twin lead"). This report will deal with single-ended cables that are most commonly used in broadcast transmission. (Some of the references listed at the end of the article describe the procedures used with balanced transmission lines.)

Crimps and mismatches

Because the surge impedance of a transmission line is based upon its cross-sectional characteristics, its impedance can be changed if the cable is compressed or bent past its recommended bend radius. The inner and outer conductors would no longer have the same spacing between them at that point, causing a change in impedance there. (See Equation 1.) This change of impedance causes some of the energy in the line to be reflected in both directions. Some of the energy never reaches the load. Standing waves are created, which in turn cause energy to be radiated by the transmission line. (A perfectly matched transmitter, line and load system has no standing waves, no lost energy except for dielectric losses, and no radiation from the transmission line itself.)

A crimp in a line will cause an increase of capacitance at that point. This will cause the impedance to be reduced. The resulting TDR waveform is shown in **Figure 1.**

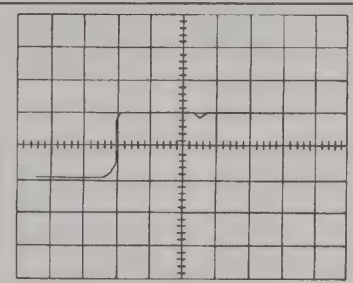


Figure 1. Simulated display showing the effect of a crimp in a transmission line.

Now, consider a 75Ω load connected to the end of a 50Ω coaxial cable. The TDR waveform that results from the mismatch at the end of the line is characterized by an upward deflection of the waveform shown in Figure 2, similar to that exhibited by an open condition. In the mismatch, however, the $E_{REFLECTED}$ (E_R) is not the same amplitude as the $E_{INCIDENT}$ (E_I). The voltage ratio of E_R to E_I is denoted by the Greek letter rho (ρ):

$$\textit{Equation 4:}\quad \rho = E_R / E_I$$

The absolute value of ρ may be either positive or negative, depending on whether a mismatched impedance is higher (positive) or lower (negative) than the source impedance. For the example shown in Figure 2,

E_R = 1 division and E_I = 5 divisions. That means ρ = 0.2. If the vertical sensitivity is set at 0.2V per division, that would mean that E_R = 0.2V and E_I = 1V.

To determine the load impedance (Z_L) once ρ is known (and verify that it is equal to 75Ω), employ this useful formula:

$$\text{Equation 5: } Z_L = Z_0 \frac{1+\rho}{1-\rho}$$

The distance to the impedance mismatch will be calculated as shown in Part 1, using D = V_P x T/2. For RG-58/U, the V_P is 0.65 ft/ns. If T = 280ns, D = 91 feet to the mismatch.

Table 1 shows 16 ρ values, the corresponding multiplication factors, and the resultant Z_L for 50Ω and 75Ω values of Z_0.

Mismatches can occur between connectors and sections of transmission line. Manufacturers will often specify what type of cable a connector is to be placed with instead of listing its surge impedance. Although this may be adequate for ordering connectors for a given installation, consider the spare parts stock issue. What happens when you reach in the parts drawer for a BNC or N connector and grab the first one you see? Unless you have an experienced eye, you're liable to pick the wrong one and create a mismatch.

If you try to use a 50Ω connector on a 75Ω fitting, you will not only have an impedance mismatch, but you will also split the 75Ω female fitting. This will, of course, create an intermittent connection, especially when the cable is hanging loosely or when there are extreme temperature changes.

A 75Ω connector placed between two sections of 50Ω cable will cause an upward bump in the waveform, as shown in **Figure 3.**

Naturally, voltage standing wave ratio (VSWR) has a part in this analysis. Remember that VSWR = Z_1/Z_2, where Z_1 and Z_2 represent the two impedances involved in the mismatch (the larger impedance is always the numerator so that VSWR is ≥ 1). VSWR is, in fact, what Z_0 is multiplied by in Equation 5 to find Z_L:

$$\text{Equation 6: } VSWR = \frac{1+\rho}{1-\rho}$$

So, a 50Ω to 75Ω mismatch not only has a VSWR based on 75/50 = 1.5, but also a VSWR derived as follows:

$$VSWR = \frac{1+0.2}{1-0.2} = 1.5$$

Meanwhile, power is proportionate to the square of voltage, and ρ is the ratio of E_R to E_I. It follows that the ratio of reflected power (P_R) to forward power (P_F) is equal to ρ^2. Therefore, if you know ρ and the forward power, the reflected power can be calculated in this manner:

$$\text{Equation 7: } P_R = \rho^2 \times P_F$$

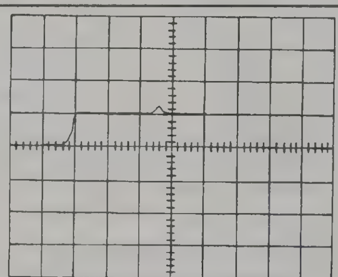


Figure 3. Simulated display showing the effect of placing a 75Ω connector between two sections of 50Ω cable.

Multiple mismatches

Unfortunately, if there is more than one discontinuity in the cable system, it becomes more difficult to determine the impedance of the second and subsequent mismatches.

Some TDR manufacturers have attempted to provide correction factors to account for multiple mismatch errors, but they won't work for all situations. In general, the larger the first mismatch, the greater the error in calculating the second mismatch. When the values of the mismatched cable sections and/or loads are known, you can work backward and calculate what the ρ values should have been. When the cable values and/or loads are unknown, only the first mismatch can be calculated accurately

Mismatches can even occur between connectors and sections of transmission line.

Note that when a 75Ω cable is connected to a 50Ω pulse generator, the first mismatch has already occurred, so the second mismatch will not have the proper value of ρ. A simple L-pad between the 50Ω generator and the 75Ω cable can create the proper impedance match and avoid this problem.

"Dribble up"

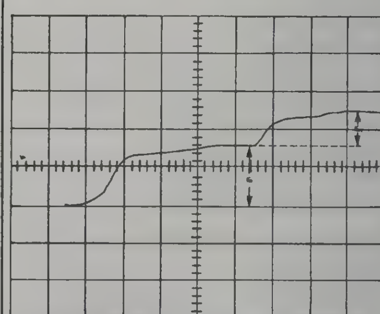


Figure 4. Simulated display illustrating the phenomena of "dribble up" caused by high-frequency losses in a transmission line.

You may have noticed that some cables take a long time to "charge up". This is sometimes described as *dribble up* and is caused by high-frequency losses. It is particularly noticeable in long lengths of cable. Cables often have a fast rise time for the first half of the pulse

response (rise time) is often measured from 0% to the 50% point (this value of rise time will give a more accurate indication of the cable's bandwidth than the 10% to 90% figure used in amplifiers). Dribble up is not usually a problem in short cable runs.

Because of dribble up you will have to be careful where, on the vertical scale, you measure the ρ value. Be sure to measure the pulse amplitude for the incident and the reflected voltages at the point where they have reached full charge, as shown in Figure 4.

ρ	MULTIPLIER	Z_1	
		$Z_O = 50\Omega$	$Z_O = 75\Omega$
+1.000	∞	∞	∞
+0.980	100	5,000	7,500
+0.970	60	3,000	4,500
+0.961	50	2,500	3,750
+0.905	20	1,000	1,500
+0.818	10	500	750
+0.667	5	250	375
+0.333	2	100	150
+0.000	1	50	75
−0.333	0.5	25	37.5
−0.667	0.2	10	15.0
−0.818	0.1	5	7.5
−0.905	0.05	2.5	3.75
−0.961	0.02	1.0	1.50
−0.970	0.167	0.833	1.25
−0.980	0.010	0.500	0.75
−1.000	0.000	0.000	0.000

Table 1. ρ values, multipliers and their corresponding Z_L values for 50Ω and 75Ω surge impedances (Z_O).

Test equipment requirements

Keep in mind that most service-type oscilloscopes are limited in vertical amplifier bandwidth and horizontal sweep frequency ranges. They also use analog technology for the most part.

The vertical amplifier bandwidth will affect the displayed pulse rise time, thus limiting your ability to define beginning and ending points on the waveform, and masking some of the cable characteristics that occur closest to the test instruments. Limited horizontal sweep frequency range will affect the resolution required to accurately determine distances.

Consider these characteristics, therefore, the next time you buy an oscilloscope. You may cringe at the price of a 100 MHz oscilloscope, but it could be an extremely wise investment. It assures you a rise time of 3.5ns (a leading-edge error of about 1 foot with polyethylene dielectric cables) and typically provides a horizontal sweep frequency of 5ns/division (with a 10 x magnifier), which would allow a distance resolution of 1.75 feet per

Cables often have a fast rise time for the first half of the pulse and a slow charging rate for the last half.

major division and 0.35 feet per minor division. (These figures take into account that the waveform represents round-trip time, so it's 3.5ns/2 and 5ns/2 times the velocity factor.) A special feature called *delay time multiplication* is available with most 100 MHz oscilloscopes, and it allows extremely accurate timing measurements.

The rise time of the pulse becomes even more critical when your oscilloscope has a fast risetime.

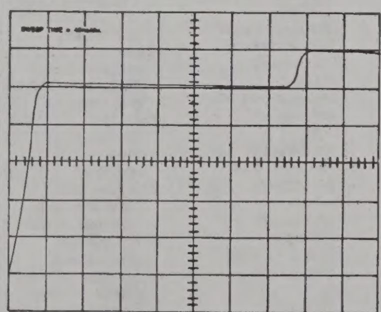


Figure 2. Simulated display showing the effect of connecting a 75Ω load to a 50Ω transmission line (cable).

In fact, the total rise time (T_R total) of the pulse generator and the oscilloscope is as follows:

Equation 8: T_R total = $\sqrt{(T_R \text{ pulse}}$

An oscilloscope with a 3ns rise time and a pulse generator with a 3ns rise time would have a total rise time of:

T_R total = $\sqrt{(3^2 + 3^2)} = \sqrt{18} = 4.$

If your equipment uses digital computers and control logic, rise times become extremely significant, particularly where gates are concerned. You simply can't look at rise times with a 10 MHz oscilloscope when the synchronization of a control function depends on multiple gate inputs reaching the turn-on threshold within 2ns or 3ns. The 100 MHz oscilloscope provides waveform analysis and time domain reflectometry to a high degree of accuracy.

Kolbert is chief engineer at KLSE-FM and KZSE-FM, Rochester, MN.
from Broadcast Engineering

Every wonder where to write to solve an RFI/TVI problem?

Here is a list of consumer electronic companies and their addresses. Keep it handy. You never know when you might need it!

Acoustic Research
330 Turnpike St
Canton, MA 02021
(617) 821-2300

a/d/s/
One Progress Way
Wilmington, MA 01887
(617) 658-5100

Aiwa
35 Oxford Dr
Moonachie, NJ 07074
(201) 440-5220

AKG
77 Selleck St
Stamford, CT 06902
(203) 348-2121

Alpine (Luxman)
19145 Gramercy
Torrance, CA 90505
(213) 326-8000

Altec-Lansing
Rte. 6 & 209
Milford, PA 18337
(717) 296-4434

Ambico
50 Maple St
Norwood, NJ 07648
(201) 767-4100

Arkon
11627 Clark St
Arcadia, CA 91006
(818) 358-1133

AudioSource
1327 N. Carolan Ave
Burlingame, CA 94010
(415) 348-8114

Audio-Technica
1221 Commerce Dr
Stow, OH 44224
(216) 686-2600

Azden Corp.
147 New Hyde Park Rd
Franklin Sq., NY 11010
(516) 328-7500

Bang & Olufsen
1150 Feehanville Dr
Mt. Prospect, IL 60056
(312) 299-9380

Bescor
244 Rte 109
Farmingdale, NY 11735
(516) 420-1717

Bogen
565 E Crescent Ave
Ramsey, NJ 07446
(201) 818-9500

Bondwell
47485 Seabridge Dr
Fremont, CA 94538
(415) 490-4320

Bose Corp.
100 Mountain Rd
Framingham, MA 01701
(617) 879-7330

Boston Acoustics
70 Broadway
Lynfield, MA 01940
(617) 592-2000

Canon
One Cannon Plaza
Lake Success, NY 11042
(516) 488-6700

Canton
915 Washington Ave So
Minneapolis, MN 55415
(612) 333-1150

Case Mfg. Co.
2637 E Greene Dr
Highpoint, NC 27406
(919) 272-1133

Casio
570 Mt. Pleasant Ave
Dover, NJ 07801
(201) 361-5400

Chinon America Inc
43 Fadem Rd
Springfield, NJ 07081
(201) 376-9260

Cinema Products
3211 South La Cienega Blvd
Los Angeles, CA 90016
(213) 836-7991

Citizen Watch
1200 Wall St W.
Lyndhurst, NJ 07071
(201) 438-8150

Coastar
200 Corporate Blvd. So.
Yonkers, NY 10701
(914) 376-1500

Commodore
1200 Wilson Dr.
W. Chester, PA 19380
(215) 431-9100

Cool-Lux Lighting
5723 Auckland Ave.
Hollywood, CA 91601
(818) 761-8181

Crown International
1718 W. Mishawaka Rd
Elkart, IN 46517
(219) 294-8000

Curtis-Mathes
1141 Greenway Dr.
Irving, TX 75062
(214) 550-8050

dbx, Inc.
71 Chapel St
Newton, MA 02195
(617) 964-3210

Denon America
222 New Rd
Parsippany, NJ 07054
(201) 575-7810

Dual Voltage
7301 W. 108 Pl.
Worth, IL 60452
(312) 361-1110

Emerson Radio Corp.
One Emerson Ln
N. Bergen, NJ 07047
(201) 854-4800

Fisher
21314 Lassen St
Chatsworth, CA 91311
(213) 998-7322

Fosgate Inc.
55 W. South St
Heber City, UT 84032
(801) 654-4046

Fuji
555 Taxter Rd.
Elmsford, NY 10523
(914) 789-8100

G.E.
1 College Blvd.
Portsmouth, VA 23705
(804) 483-5000

Goldstar Elec.
1000 Sylvan Ave.
Englewood Cl., NJ 07632
(201) 460-8870

Hama
7200 Huron River Rd
Dexter, MI 48130
(313) 426-4646

Harman/Kardon (JBL)
240 Crossways Park
Woodbury, NY 11797
(516) 496-3400

Hitachi Sales Corp.
401 W. Artesia Blvd.
Compton, CA 90220
(213) 537-8383

Infinity Systems
9409 Owensmouth
Chatsworth, CA 91311
(818) 709-9400

Instant Replay
2601 S. Bayshore Dr.
Miami, FL 33133
(305) 854-8777

Jasco
311 NW 122nd St.
Oklahoma City, OK 73114
(405) 752-1537

JBL
(See Harmon Kardon)

Jensen
25 Tri State Intl Ctr
Lincolnshire, IL 60069
(708) 317-3783

JVC
41 Slater Dr
Elmwood Park, NJ 07407
(201) 794-3900

Kenwood Elect.
1315 E. Watsoncenter
Carson, CA 90745
(213) 639-9000

Koss
4129 N Pt. Washington
Milwaukee, WI 53212
(414) 964-5000

Lowel-Light Mfg.
150 58th St.
Brooklyn, NY 11220
(718) 921-0600

Lowe Pro
620 Compton
Bloomfield, CO 80302
(303) 465-3706

Luxman
(See Alpine)

Magnavox
(See NAP)

Marantz Co.
20525 Nordoff St
Chatsworth, CA 91311
(818) 998-9333

Maxell
60 Oxford Dr.
Monnachie, NJ 07074
(201) 641-8600

Memtek Products
2155 So. Bascom Ave
Suite 200
Campbell, CA 95008
(408) 559-2900

MFJ Enterprises
PO Bx 494
Mississippi State, MS 39762
(800) 647-1800

Minolta
101 Williams Dr
Ramsey, NJ 07446
(201) 825-4000

Mitsubishi
5757 Plaza Dr.
PO Bx 6007
Cypress, CA 90630
(714) 220-2500

NAD
875 Canton St
Norwood, MA 02062
(617) 769-7050

Nady Systems
6701 Bay Street
Emeryville, CA 94608
(415) 652-2411

NAP Consumer Elec. (Magnavox, Philco, Philips, Sylvania)
I-40 & Straw Plains Pike
PO Bx 6950
Knoxville, TN 37914
(615) 521-4316

NewTek
115 W. Crane St
Topeka, KS 66603
(913) 354-1146

Niles Audio
12331 S W 130th St
Miami, FL 33186
(305) 238-4373

Olympus
Crossways Park
Woodbury, NY 11797
(516) 364-3000

Onkyo
200 Williams Dr.
Ramsey, NJ 07446
(201) 825-7950

ORA Elect.
20120 Plummer St
Chatsworth, CA 91313
(818) 701-5848

Panasonic
One Panasonic Way
Secaucus, NJ 07094
(201) 348-7000

Pentax Corp.
35 Inverness Dr. E
Englewood, CO 80112
(303) 799-8000

Phillips
(See NAP)

Pioneer Elect.
5000 Airport Plaza Dr.
Long Beach, CA 90815
(213) 420-5700

Polaroid Corp.
549 Technology Sq.
Cambridge, MA 02139
(617) 577-2000

Polk Audio
1915 Anapolis Rd
Baltimore, MD 21230
(301) 837-4300

Precise Acoustic Labs
200 Williams Dr.
Ramsey, NJ 07446
(201) 934-1335

Proton Corp.
5630 Cerritos Ave.
Cypress, CA 90630
(714) 952-6900

Pulsar Video
7732 Clairemont Mesa
San Diego, CA 92111
(619) 278-4318

Quasar
1325 Pratt Blvd
Elk Grove Vil., IL 60007
(312) 228-6366

Radio Shack
(see Tandy)

Realistic
(See Tandy)

RCA Sales Corp.
600 N. Sherman Dr.
Indianapolis, IN 46201
(317) 267-5000

RCA Accessories
2000 Clements Bridge
Deptford, NJ 08096
(609) 853-2243

Recoton
46-23 Crane St
LIC, NY 11101
(718) 392-6442

Runco
26203 Production Ave
Hayward, CA 94545
(415) 293-9154

Saft
711 Industrial Blvd.
Valdosta, GA 31601
(912) 247-2331

Samson Technologies
262 Duffy Ave.
Hicksville, NY 11801
(516) 932-3810

Samsung
301 Mayhill St
Saddle Brook, NJ 07662
(201) 587-9600

Sansui
1290 Wall St. W
Lyndhurst, NJ 07071
(201) 470-9610

Sanyo Elec.
1200 W. Artesia Blvd
Compton, CA 90220
(213) 537-5830

Satter Incorporated
4100 Dahlia
Denver, Co 80213
(303) 831-7481

Scriptovision
7419 Lajeunesse
Montreal, Quebec
Canada H2R 2J1
(514) 271-2265

Sharp Elect.
10 Sharp Plaza
Paramus, NJ 07652
(201) 529-8200

Sherwood
13845 Artesia Blvd.
Cerritos, CA 90701
(213) 926-6337

Shintom West Corp.
20435 S. Western Ave
Torrance, CA 90501
(213) 328-7200

Showline Video
120 Beacon St
Boston, MA 02116
(617) 262-6844

Shure Bros.
222 Hartrey Ave
Evanston, IL 60202
(708) 866-2200

Shure HTS
222 Hartrey Ave
Evanston, IL 60202
(708) 866-2279

Sigma Corporation
15 Fleetwood Ct.
Ronkonkoma, NY 11779
(516) 585-1144

Signet
4701 Hudson Dr.
Stow, OH 44224
(216) 688-9400

Sima
4001 W. Devon Ave
Chicago, IL 60646
(312) 286-2333

Silk America, Inc.
3 Westchester Plaza
Elmsford, NY 10523
(914) 347-2223

Sonance
32992 Callie Perfecto
San Juan
Capistrano, CA 92675
(714) 661-7558

Sony Consumer Prod.
Sony Dr.
Park Ridge, NJ 07656
(201) 930-1000

Soundesign Corp.
Harborside Center
34 Exchange Place
Jersey City, NJ 07302
(201) 434-1050

Studer Revox
1425 Elm Hill Pike
Nashville, TN 37210
(615) 256-7619

Surround Sound, Inc.
400 South Dale Ave
Alhambra, CA 91803
(818) 282-9419

Sylvania
(See NAP)

Symphonic
100 North St
Teterboro, NJ 07608
(800) 242-7158

Tamrac
6709 Independence
Canoga Park, CA 9130[illegible]
(818) 715-0090

Tamron Industries, Inc.
99 Seaview Blvd
Port Wash, NY 11050
(516) 484-8880

Tandy
1600 1 Tandy Center
Fort Worth, TX 76102
(817) 390-3011

Technics
One Panasonic Way
Secaucus, NJ 07094
(201) 348-7000

Teknika
353 Rte 46 W
Fairfield, NJ 07006
(201) 575-0380

Tenba Inc.
503 Broadway
New York, NY 10012
(212) 966-1013

Tokina
1512 Kona Dr
Compton, CA 90220
(213) 537-9380

Toshiba
82 Totowa Rd
Wayne, NJ 07470
(201) 628-8000

Uniphot
61-10 34 Ave.
Woodside, NY 11377
(718) 779-5700

Varta
300 Executive Blvd
Elmsford, NY 10523
(914) 592-2500

VDO-PAK Products
PO Bx 290969
Port Orange, FL 32029
(800) 874-5906

Vector Research
1230 Calle Suerte
Camarillo, CA 93010
(805) 987-1312

Velbon
2433 Moreton St
Torrance, CA 90505
(213) 530-5446

Videonics Inc.
1129 Dell Ave
Campbell, CA 95008
(408) 866-8300

Vidicraft
0704 SW Bancroft
Portland, OR 97201
(503) 223-4884

Vivitar Corp.
9350 DeSoto Ave
Chatsworth, CA 91311
(818) 700-2890

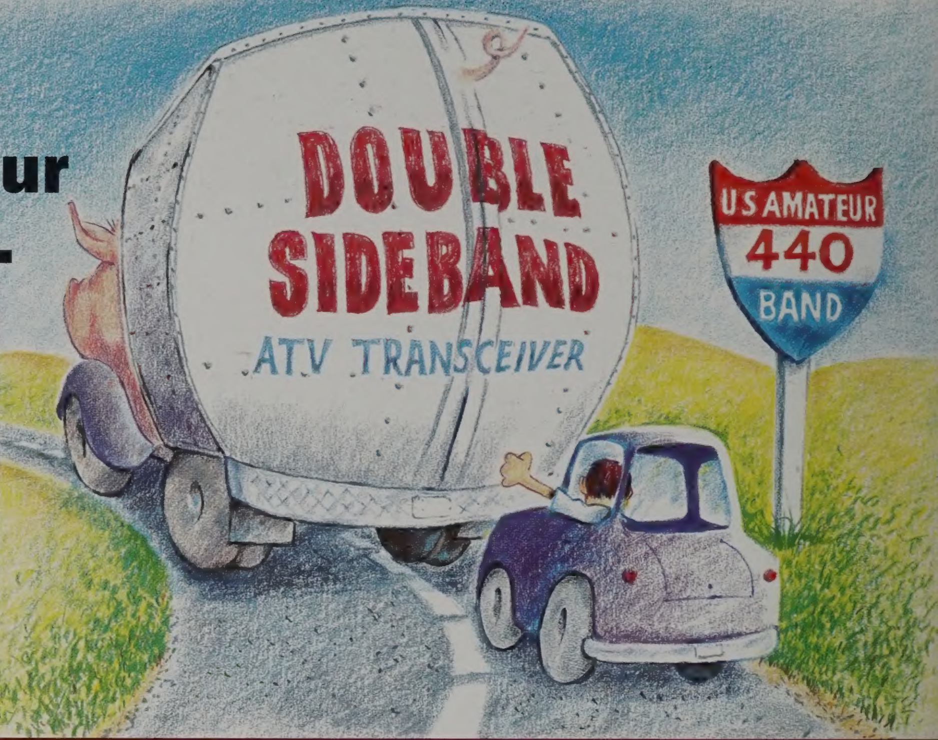
Yamaha Elect.
6660 Orangethorpe
Buena Park, CA 90620
(714) 522-9105

Yashica, Inc.
100 Randolph Rd
Somerset, NJ 0887
(201) 560-0060

Zenith
100 Milwaukee Ave
Glenview, IL 60025
(312) 391-7000

Don't Be An Amateur Band Hog.

If you're using a traditional double-sideband (DSB) Amateur Television transceiver, you're, in effect, hogging the band. DSB not only wastes power on the unused sideband, but uses almost twice the spectrum necessary. Not good, considering how limited the spectrum is to begin with.



VSB-70 with Vestigial Sideband

The VSB-70 from AEA is the only amateur television transceiver that uses Vestigial Sideband (VSB), the same modulation method used by commercial TV stations. Our VSB technology reduces the unwanted sideband over 40dBc! More power where it should be and less wasted spectrum space.

Also available is the RLA-70 mast-mount linear amplifier (with power supply), which boosts your signal while preserving the characteristics of VSB.

Be a good spectrum neighbor. Use the AEA VSB-70 ATV System.

For a complete specification sheet on the VSB-70 or any other product, call 1-800-432-8873.

Advanced Electronic Applications, Inc.

P.O. Box C2160/2006 196th St. S.W. • Lynnwood, WA 98036
Tech Support & Sales (206)775-7373 • Office (206)774-5554
CompuServe User ID 76703, 1012 • Brochure InfoLine (800)432-8873